

FLIGHT

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The Tatsfield Crash

SOME years ago, before the war, several Christmases were made sad by bad railway accidents in the North of England which almost threatened to become annual events. More recently, about ten years ago, there was a bad aeroplane crash near Croydon, just before Christmas, and now once more a number of homes will be filled with mourning at the festive season by the loss of a Sabena machine in the valley of the North Downs between Tatsfield and Biggin Hill. It is some consolation that an aeroplane crash takes fewer lives than does a bad railway disaster, but in this case Great Britain has to mourn the loss of a distinguished man in Sir John Carden.

Until the wreckage has been inspected by experts one can only speculate on the cause of the crash. It is known that on that evening other aeroplanes were troubled by the formation of ice on the wings. It is also manifest that happier situations for a pilot may be imagined than climbing in the dark up a steep valley in the hills to reach an aerodrome on the summit—if that is what was happening. It would not be difficult in such a case to hit a tree with a wing.

There are, of course, many other possible explanations of the accident. A slight error in altimeter reading may account for a pilot being somewhat lower than he thinks, and the nature of the district in which the accident occurred is such that a small deviation from the course, coupled with an unsuspected error in altitude, might well have resulted in the accident.

The wind at the time is believed to have been very variable. This may have resulted in the ill-fated machine being some few miles short of the location estimated by the pilot; it is possible that he was coming down, thinking that he was nearer to Croydon than, in fact, he was. D/F. wireless may at times show considerable error, particularly at dusk, and this cannot be entirely ruled out as a possible contributory cause.

There seems no lesson to be learnt from this tragedy,

unless it is proved that ice did form on the wing. That is by no means certain, but some explanation is needed as to why an experienced pilot was flying so low. If he found ice-forming conditions higher up, that would be sufficient explanation. Once he had got into the valley he may have found his difficulties increased by down-currents of air. In the dark he may have seen the lights of houses below him at the bottom of the valley, and have been unaware of the proximity of the sides of the valley.

The results of ice forming along the leading edge of the wing have been frequently explained in *Flight*. Briefly, the crust of ice alters the wing section and interferes with the flow of air. Ice formation in the carburettors is another possible cause, and would result in loss of power, which would account for the low altitude at which the machine was flying.

Methods exist which will safeguard an aeroplane from the ice danger. More than one country has given earnest consideration to the problem, and devices are available for combating the risk of ice formation on parts of the aircraft and in the carburettors of the engines.

Plastics

OPINIONS appeared somewhat divided at the discussion between members of the aircraft and the plastics industries, reported in this issue of *Flight*. Shortcomings in the modulus of elasticity came in for criticism, and the cost of tools was generally admitted to be a stumbling block until such time as the "number off" is considerably greater than at present.

The need for closer co-operation between the two industries was stressed by more than one speaker, and there is no doubt that much can be done to improve the present position, once the aircraft designers let the plastics manufacturers know their exact requirements. To us it seems that, generally speaking, the representatives of the aircraft industry were inclined to think rather too much in terms of the present type of girder structures.

the members of which are mostly in long lengths and therefore at present costly to manufacture in plastic material. Mr. George Cornwall very rightly pointed out that it is necessary to estimate what is likely to be the type of construction of the future, and if he is right in thinking that this will be of the stressed-skin type, then designers should begin at once to think of phenol-formaldehyde synthetic resins in the form of sheets. In that form the material is not, as will be seen from a table of comparative figures published on page 655, very inferior to duralumin, in spite of the relatively low value of Young's modulus.

When plastic materials are used as sheets the main problem to be solved appears to be that of a suitable jointing material. Already a considerable amount of work has been done in this direction, and very promising results have been obtained. It should not be beyond the ability of chemists and engineers to evolve a really satisfactory cement, and if the phenol-formaldehyde synthetic resins can be slightly improved, their application to aircraft construction need not be very long deferred.

The Bombing of Dessie

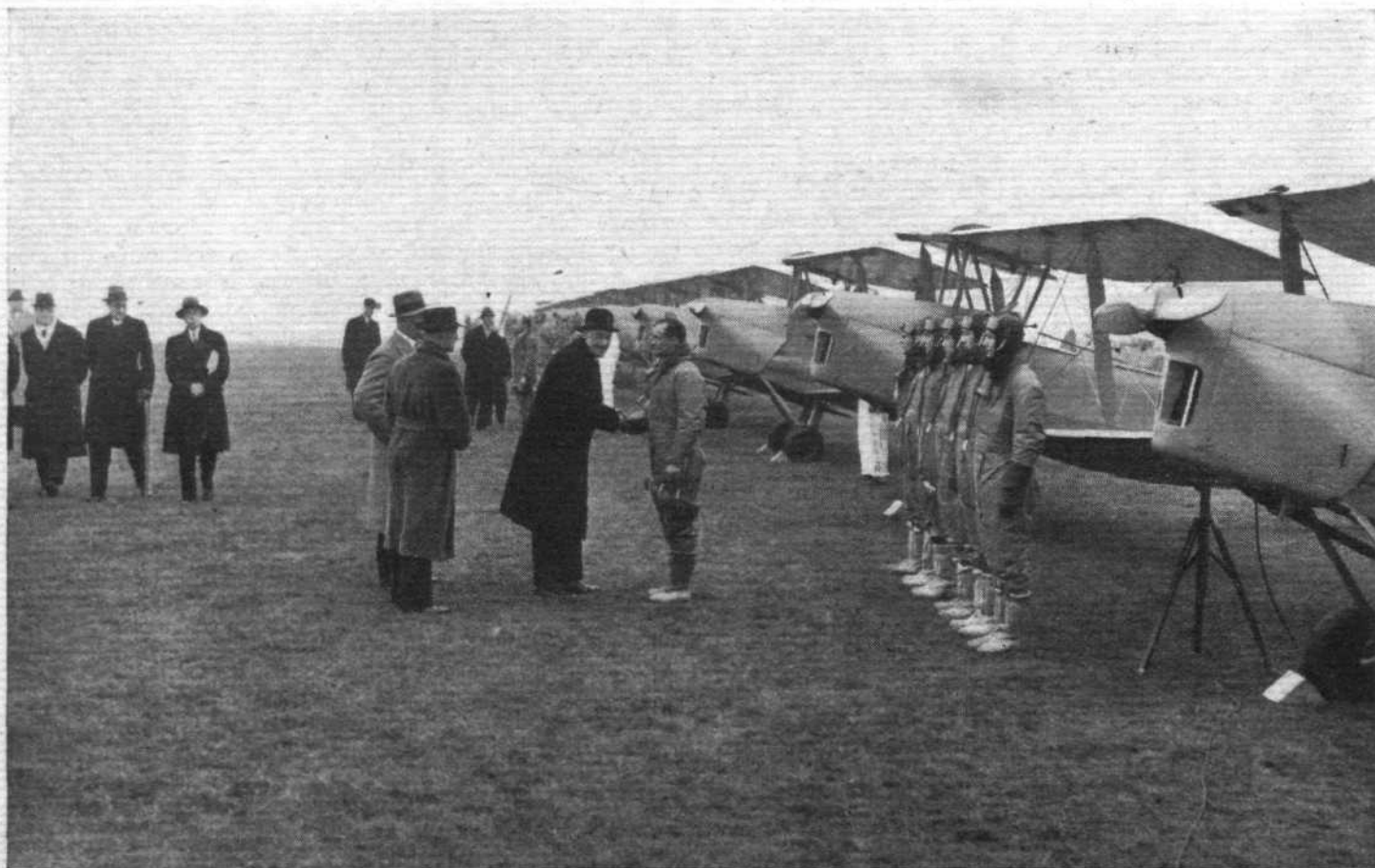
THE bombing of the American hospital at Dessie by Italian aeroplanes is a tragedy which all must deplore. One cannot yet pronounce judgment on it because the accounts are contradictory. One report says that the Italians had not been officially informed that there was a foreign hospital in the place, and suggests that the Italian bomb-aimers either could not see

the red crosses on the roofs or distrusted their authenticity, while another report says that the Italians were convinced that combatants had taken refuge in the hospital and so had deprived it of the immunity to which it would otherwise have been entitled. The rights and wrongs of the case may never be determined.

The Right Use of Bombers

It is very pleasing to see that the allegations that the Italians were using poison-gas bombs have been abandoned. Poison gas is the most brutal thing which can be used in war, and its use has been condemned by general consent at Geneva. The Italians, although their attack on Ethiopia is without justification, are not a brutal race, and everyone would have been deeply shocked if they had had recourse to gas. On the whole, it may be said that they have used their bombing aircraft as such weapons ought to be used, as long-range artillery. They have dispersed (perhaps only for the time) gatherings of Abyssinian troops, and have bombarded fortified positions. These operations have not been without risk, for the aeroplanes have been under hot fire and have been hit many times, though hitherto there have been only two Italian airmen killed.

Worse than the fire of the enemy has been the country over which the bombers have had to fly. Very often it would be impossible to bring off a forced landing without disaster, and even a safe landing might not mean safety. The crews of some captured tanks were beheaded, and it is not likely that the crews of the dreaded aeroplanes would be treated in a more chivalrous way.



PRIMARY TRAINING. Viscount Swinton of Masham, our energetic Secretary of State for Air, inspecting a parade of instructors, pupils and Tiger Moths during his visit, last Friday, to the new Reid and Sigrist flying training school at Desford, near Leicester. This school is the ninth of the thirteen of its kind which are being introduced for the primary training of regular and reserve pilots of the R.A.F. under the expansion scheme. A full account of the opening ceremony appears on pages 644 and 645. (*Flight* photograph.)

The Outlook

A Running Commentary on Air Topics

Penny-wise

HITHERTO it has been customary for a representative of the Air Ministry when delivering a lecture to the Royal Aeronautical Society to be very careful to point out that his views were personal ones and did not necessarily represent the opinion of the Air Ministry. It is logical to suppose that the same proviso would be applied to articles published elsewhere, and that when no such "disclaimer" is voiced the views may be taken to be those of the Ministry. If that is so, a curious position arises in connection with an article in *The Air Annual of the British Empire* for 1935-36. Written by Major R. E. Penny, O.B.E., under the title "Flying-boat Development," the article very rightly calls attention to the fact that by adopting a short-sighted financial policy Great Britain has suffered a set-back in civil flying boat development.

Major Penny expresses strong views on the Short-Mayo composite aircraft, as will be gathered from the quotation of one sentence: "... this method of launching would appear to be still-born as far as the Atlantic is concerned." In view of the fact that Major Penny is closely associated with flying boat development at the Air Ministry (on the military side), and assuming in the absence of a disclaimer that his views are shared by the Ministry, that is a somewhat peculiar statement when one remembers that the Ministry is contributing towards the cost of the first Short-Mayo composite aircraft.

One feels that Major Penny has been rather incautious in several of his remarks. For example, in commenting on the great strides made by America, he states that "... it is not surprising that American civil aviation is pre-eminent in speed, safety, durability, technical development and ground organisation." Divorced from its context that sentence is likely to give a very false picture of the situation, and if it is assumed to have the blessing of the British Air Ministry one may expect to see it quoted widely abroad as an official admission of a British inferiority complex. Apart from the fact that the sentence is far too sweeping and open to challenge, it is a curious statement for an Air Ministry official to make.

The D.H. 86 "Mystery"

UNTIL reports from De Havilland engineers in Australia arrived in this country it was impossible to know exactly what happened to the Holyman Air Line's D.H.86 *Lepena*, which was damaged in a forced landing on Hunter Island. The original report stated that the pilot had announced by wireless before landing that a flying wire had broken. Mr. Parkhill, the Australian Minister for Defence, announced that the C. of A. of all D.H.86s had been suspended until an investigation could be made. The C. of A. was restored two days later, the Ministry of Defence stating that the committee of inquiry's report disclosed no structural defect which would have accounted for the accident.

The expression "no structural defect which would have accounted for the accident" was open to several interpretations. It might have meant that the particular wing bracing wire which broke, if one did break, would not have caused the wing structure to become unsafe, owing to redundancies in the bracing which would transmit the loads along an alternative path. The pilot might, however, have considered it correct, in the circumstances, to make a precautionary forced landing. In this he apparently suc-

ceeded, as no one was injured, although the machine is reported to have been damaged.

In this connection it seems worth while pointing out that the D.H.86 is in use by seventy-six operators, whose machines have, between them, covered the imposing total of ten million miles. These figures do not point to any likelihood of defective design, and this reflection is substantiated by a report which reaches us just as we go to press—the expected message from the D.H. engineers in Australia to the British company. It appears that it was nothing more serious than the fact that the small sheet-metal fairing covering the strut-end and wire attachment was "lifting" slightly, giving the optical impression that the strut itself was coming adrift.

Where Angels Fear . . .

THE experience gained so far with the *Pou-du-Ciel* is that the take-off is by far the most difficult part.

M. Mignet has stated over and over again, and emphasises it on every possible occasion, that the beginner should choose a windless day or morning, and should spend a lot of time in taxiing, doing gradually lengthening straight hops a foot or two off the ground, and that not until he has thoroughly got the "feel" of the machine should he attempt circuits.

That advice has been found thoroughly sound, and one cannot help thinking that Mr. Story, of Southend, was very lucky indeed last Sunday when, it has been reported, he took his recently finished *Pou* to Rochford and at once took off and did two circuits of the aerodrome. Apparently all went well, but if the reports are correct and Mr. Story had not flown before, there might very easily have been a different ending to the flight.

It is to be hoped that other amateur constructor-pilots will not, from this one lucky example, jump to the conclusion that anyone who has built a *Pou* can do likewise.

As Others See Us

A RECENT issue of the French aviation journal *Les Ailes* refuses to get excited about the new Hawker monoplane single-seater fighter. In this connection it is, perhaps, worth recalling that competitions are being held in France and in the United States for single-seaters of similar purpose and characteristics, and that consequently our French friends are keeping a close eye on developments outside France.

"The chief cause for technical excitement," our French contemporary states, "is that the new Hawker is fitted with the new Rolls-Royce Merlin engine. This is a twelve-cylinder normal vee type, with reduction gear and of greater capacity than the Kestrel. From this fact, and also because of generally greater efficiency, the power is notably increased. If one is to judge from the chunk of wood on the Hawker there is plenty of cavalry under the cowlings, more than 1,000 h.p. it is said. The small size of the ethyl-glycol radiator should be noted. . . . In spite of the dazzling performance we permit ourselves not to fall into admiration. The machine is too heavy to be manœuvrable, too powerful to have the range necessary for making contact with the enemy. As we see it, the new Hawker is an experimental speed aeroplane, and not a truly military aircraft, the more so as the practical conditions of chasing at speeds approaching the 'limiting performance' are still unknown."

Preparing Imperial Airways Pilots for the New Flying Boat Programme : The Work at Air Service Training

ALTHOUGH imaginations have been fired by the Empire and Transatlantic plans of Imperial Airways and by the size and speed of the new flying boats, it is doubtful whether the casually interested person has realised the full significance of the changes. At the present time first officers can be trained one by one, and each of these shoulders, in due course, the responsibilities of a captain's rank. The work can go on slowly and unobtrusively.

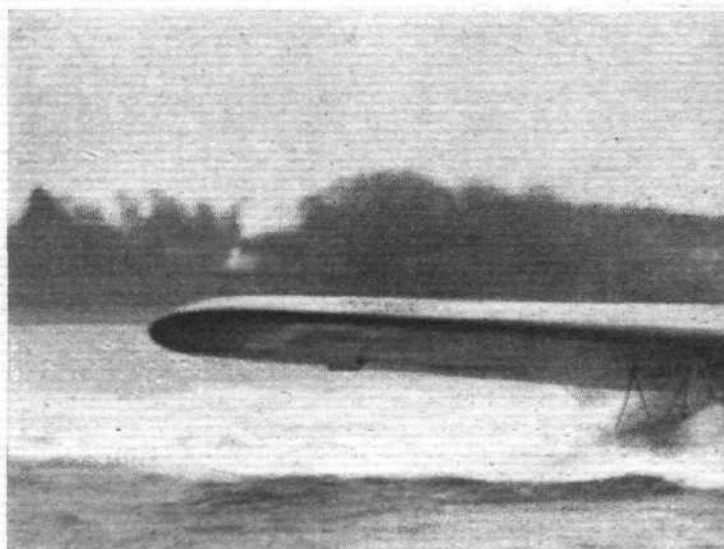
This new programme, however, will eventually demand the sudden appearance, more or less, of an extremely large number of pilots and co-pilots with an entirely new kind of experience. During the next four years something like 180 flying boat pilots will need to be trained.

The task is a prodigious one—and all the more so because only one school, Air Service Training, has the necessary facilities. A.S.T., of course, have trained both Reserve officers and civil pilots on seaplanes and boats during the past few years. For the new work they already have a Short Calcutta as well as their own Cutty Sark (two Genet Majors) for preliminary training, and another Calcutta is expected shortly.

A Flexible Syllabus

Another obvious difficulty surrounds the fact that every one of the 180 pilots will possess varied experience and different aptitudes for the work. Those who have had experience of sailing or of power craft will naturally obtain a grip of the various special problems far more quickly than those who are entirely new to the sea. The very first pilots to start on the four months' course were, for example, a Master Pilot and a probationary first officer respectively. The course must be arranged so that it is flexible enough to suit all comers.

The pupils, who will be in the hands of Flt. Lts. G. D. Middleton and M. C. Pascoe, will alternately receive



THE NEW

practical and theoretical instruction, flying some twelve or fifteen hours in the Cutty Sark, and some twenty to twenty-five hours in the Calcutta. In addition, they will go through a course of practical seamanship, which will include instruction in boat-pulling, sailing, towing, refuelling and mooring, as well as in the use of the different knots, hitches and so forth, so that the future boat pilot will not be out of his element when necessarily engaging the assistance of nautical people.

Naturally enough, the time spent in the air will not be very great, since the handling of a flying boat will present no real difficulty to the experienced landplane pilot. Much of the "flying" time will consist of taxiing and manoeuvring on the water with one, two, or three engines, in making approaches to moorings, and in making use of drogues, for instance, as necessary aids to slow-speed work in difficult conditions. While the writer was in the Calcutta last week the aforesaid Master Pilot spent

at least three-quarters of the flying period on the water taxiing quickly or slowly, making turns, using drogues and coming up to moorings under Flt. Lt. Middleton's experienced eye.

The wind was blowing at about 15-20 m.p.h. at the time and, to a spectator who was versed to some degree in sailing matters, it was interesting to see that the boat was brought up to its moorings into wind rather than into tide, which was flowing at about two knots down Southampton Water and dead across the wind. Only a few degrees were allowed for the tide, and the boat, when moored, lay across tide and almost head to wind. This little point illustrates, in some small degree, the sort of



Practical seamanship : The first Short Calcutta at its moorings in Southampton Water. In the forward hatch is Flt. Lt. Middleton, while Capt. Wilcockson, of Imperial Airways, is standing in the cockpit.



One Hundred and Eighty Pilots to be Trained at Hamble During the Next Four Years

use tide-tables so that he will be able to estimate not only the depth of the water at possible anchoring points, but also the speed and direction of the tide when there are no anchored or moored vessels to assist him. At slack water, incidentally, boats—other than those, of course, which are moored bow and stern—turn into wind, since there is no tide to affect them as they lie at anchor. During certain periods of the day anchored vessels can be seen lying at very different directions in various parts of the Solent area which, as already explained, has a complex tidal system.

Then there are new problems to be faced when a forced landing must be made in the open sea and temporary repairs have to be effected. There may come a time when the pilot, whose boat hull is badly holed through striking a floating log or other piece of debris, must know where and how to run her aground or how to buoy her up if the damage is less serious. The question of a forced landing at night should also be considered, and a pilot, in any case, must be able to superintend the laying out of a flare path. Actually, Imperial Airways use paraffin flares on the Mediterranean route, while the R.A.F. uses acetylene flares.

Manoeuvring Problems

Again, a flying boat, whether disabled or otherwise, cannot be towed just "anyhow" and at any speed, since, however robust it may be as machines go, it is still an aeroplane and not a barge. Towing in the ordinary course of mooring is an art in itself, and the business of bringing a boat up to a jetty, a ship, or a floating dock is a particularly ticklish one as, even when drogues are used, there is not a great measure of control at low speeds, and aero engines are difficult at small throttle openings.

All commercial pilots will have learnt the various rules, regulations and signals for use at sea—these even appear

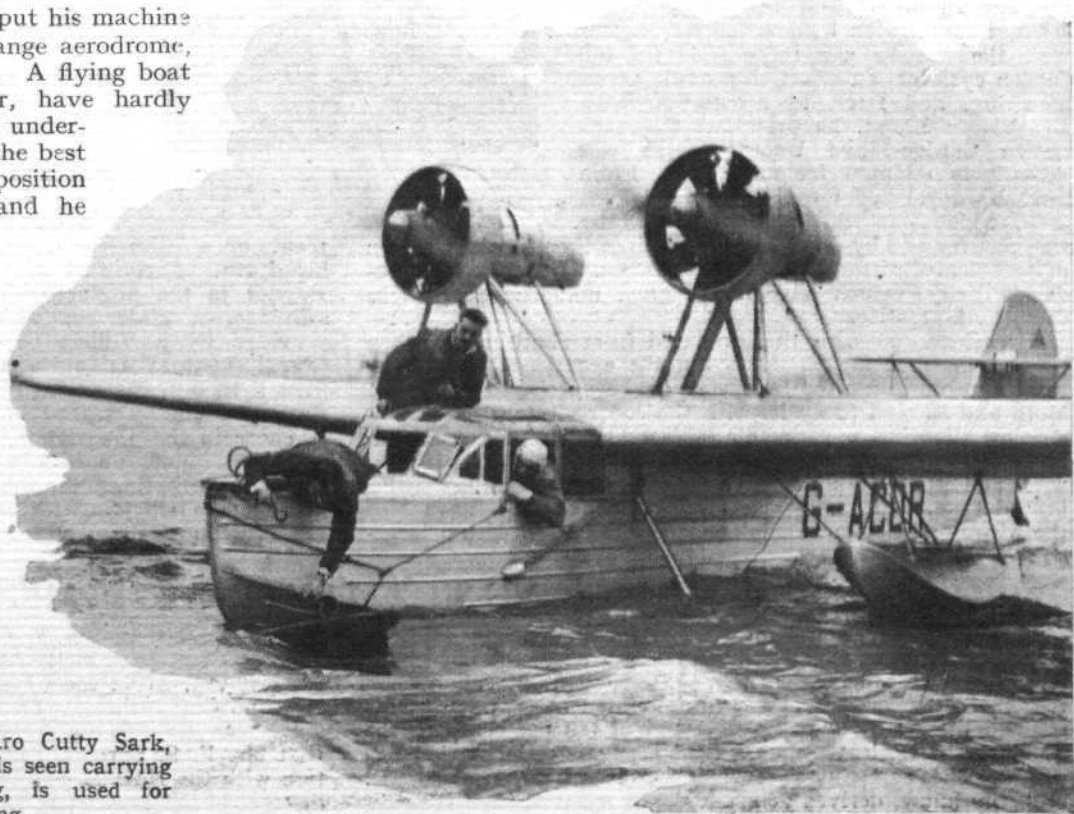
RAINING

thing for which the flying boat pilot must make allowances. With a very light wind the boat would need to be brought up almost head to tide.

Incidentally, Southampton Water and the Solent are almost ideal for training purposes, since there is plenty of shipping and a unique tidal system to worry about. At the same time, stretches of water suitable for a take-off or landing can be had in almost any weather, and, in the outlying regions, there are characteristic areas where forced-landing practice can be carried out in different conditions.

It would be impossible, of course, to explain the special syllabus in detail, but quite a number of points, other than those already touched upon, are worth mentioning if only to give the uninitiated some idea of the problems involved in the navigation and handling of flying boats.

When a landplane pilot has put his machine down, even at an entirely strange aerodrome, his troubles are virtually over. A flying boat pilot's real troubles, however, have hardly started. He must be able to understand nautical charts so that the best possible mooring or anchorage position can be discovered quickly, and he must be able to judge the nature of the sea bottom, too, if his machine is to be anchored out. On one occasion a pilot "dropped his hook" and failed to realise for a very long time that he was moving away quite rapidly from the chosen spot; his anchor was, in fact, merely dangling, since he had dropped in about thirty fathoms of good water! Obviously, a pilot must, too, be able to understand and



Picking up moorings: The Saro Cutty Sark, which, in the heading picture, is seen carrying out some high-speed taxiing, is used for preliminary training.



An amphibian has its advantages. The Cutty Sark descends the new slipway at Hamble while Flt. Lt. Middleton gives instructions from the control cabin. When the tide is out the "Cutty" can be landed on the aerodrome and taxied to its hangar.

in the *viva voce* syllabus for the ordinary "A" licence—but it is improbable that landplane pilots will have remembered all the different points, since the knowledge is not necessary to them. Fortunately, lighting and signalling rules and the "rules of the road" for use at sea are very similar indeed to those used by land and sea aircraft.

Even these brief impressions of a few of the special

problems will give some idea of the mass of knowledge and experience that will need to be obtained during the one short month of training given to each Imperial Airways pilot. The instructors of Air Service Training will need to use all their instructional skill if each and all are to be turned out of the school with the requisite background of knowledge.

THE LATE SIR JOHN CARDEN

IN last week's issue *Flight* briefly recorded its deep regret at the death of Sir John V. Carden, Bart., who, as we learned at the moment of going to press, was a passenger in the ill-fated Sabena Savoia-Marchetti which crashed at Tatsfield, near Croydon, on Tuesday evening of last week. He was returning from a business trip to Brussels.

Sir John Valentine Carden had distinguished himself as an engineer both in the aircraft world and in the sphere of internal combustion land vehicles. Shortly after the war he was responsible for the Carden cyclecar, an effort to provide cheap motoring, and later, in association with Mr. Vivian Lloyd, he produced the well-known Carden-Lloyd tractor which was extensively adopted for army use. From this was developed the Carden-Lloyd light tank, which was widely adopted both by this country and by foreign armies. Since then, in the position of technical director to Vickers-Armstrong, Ltd., he has produced designs which have had a great influence on modern army tank practice.

His association with the air dated from about 1931, when he had his first flight. Enjoying the experience, but being unfavourably impressed by the noise, he purchased a Gipsy I Moth and learned to fly it, with the express intention of conducting silencing experiments. Becoming convinced that a great deal of noise was due to the slipstream impinging on wires and struts, he next purchased a machine of an internally braced type, and having the airscrew a long way forward of the wings—a Klemm monoplane. This he fitted with a large-



Sir John V. Carden.

diameter geared-down airscrew, and subsequently with a four-bladed one. With the aid of a special Burgess silencer on the exhaust system of the Pobjoy engine he secured remarkable results, the machine making less noise than the average sports car.

In an article in *Flight* Sir John summed up his conclusions by saying that the factors which would produce the best results in the silencing of aircraft were:—

- (1) Compulsory fitting of efficient silencers.
- (2) Clean design, particularly in the immediate rear of the airscrew.
- (3) Slow-speed multi-blade airscrews placed well clear of other parts.
- (4) Small engines fitted with silent reduction gears.
- (5) Well-insulated cabins.

Subsequently he continued his experiments on a Miles Hawk, which he owned until shortly before his death. Early this year he co-operated with Mr. L. E. Baynes in the production of the Carden-Baynes auxiliary sailplane, a glider in which occasional motive power is provided by a Villiers two-stroke engine. His next successful venture is quite recent history—his development from a 10 h.p. car engine of the Carden light aero engine for *Poux* and similar craft.

Those in the aircraft circles in which he moved will sadly miss his quiet, unassuming, almost shy manner, and his immense enthusiasm for the light aeroplane in all its forms. Our readers will join with us in extending sincerest sympathy to his widow and nine-year-old son.

ARMSTRONG-SIDDELEY DEVELOPMENT

AT the annual general meeting of the Armstrong Siddeley Development Co., Ltd., held last Friday, the chairman, Sir John D. Siddeley, C.B.E., J.P., F.R.Ae.S., announced that the net revenue for the year amounted to £175,856. This enabled the board to pay a dividend of ten per cent. on the ordinary shares, leaving more than £158,000 to be carried forward. The company's revenue is, as *Flight* readers will probably know, derived from dividends received from the sub-

sidary companies—Sir W. G. Armstrong Whitworth Aircraft, Ltd.; Armstrong Siddeley Motors, Ltd.; the Hawker Siddeley Aircraft Co., Ltd.; the Gloster Aircraft Co., Ltd.; and A. V. Roe and Co., Ltd.

His many friends in the aircraft industry will be glad to learn that Mr. F. S. Spriggs, best known through his long association with the Hawker company, has been appointed managing director of the Armstrong Siddeley Development Co., Ltd.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

Presentation

Air Chief Marshal Sir Robert Brooke-Popham, Inspector General of the R.A.F., was presented, last week, to the King of Egypt by Sir Miles Lampson.

Peeping at Peking

Seventeen Japanese military aeroplanes, including nine fighters and three heavy bombers, recently flew over Peking, much to the discomfiture of some of the residents.

A Parliamentary Appointment

Viscount Swinton, Secretary of State for Air, has appointed the Duke of Northumberland to be his parliamentary private secretary in place of Capt. T. L. Dugdale, M.P.

Much Out of Little

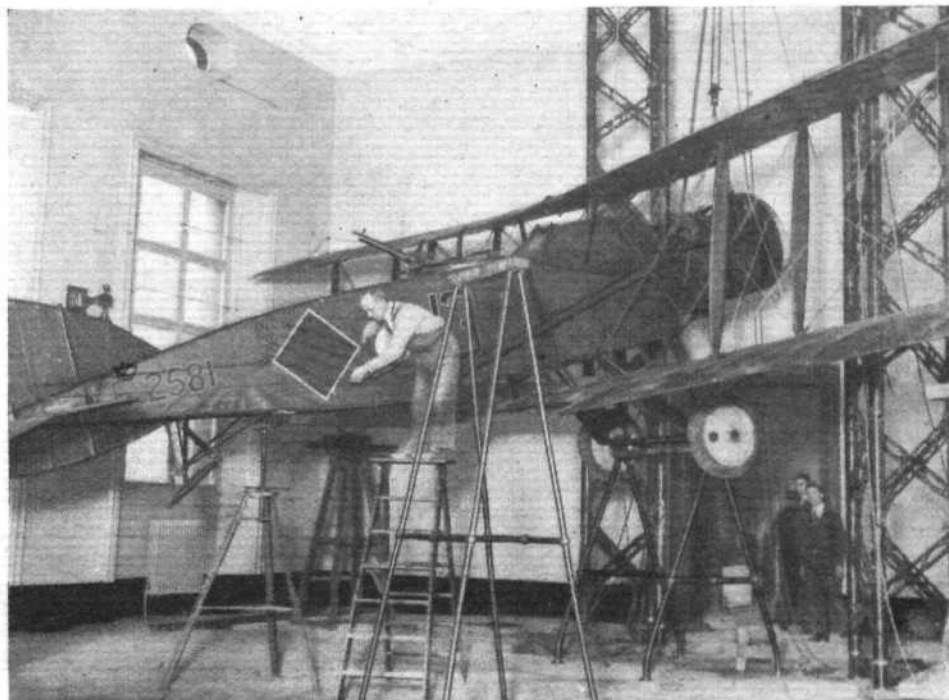
A tiny American racing machine known as the Rasmussen IIa and fitted with a 40 h.p. inverted air-cooled four-cylinder-in-line engine of 1,300 c.c. is capable of 142 m.p.h. Its gross weight is 580 lb.

A Lincolnshire Poacher

One of eleven balloons which left Gersenkirchen, near Essen, for Norway, last Sunday week, was blown off its course and carried over the North Sea, coming to earth at South Cockerington, near Louth, Lincolnshire, at three o'clock on the Tuesday. Its crew of three almost descended on to the water, just before crossing the coast, having been misled by a light which proved to be on a buoy.

Direct Lift Out East

According to a correspondent of the *Daily Telegraph*, Professor Hashimoto, a Japanese aviation expert of the Kyushu Imperial University, has perfected a machine which, though outwardly an ordinary aeroplane, has a small auxiliary engine in the middle of its fuselage which operates some device enabling it to ascend vertically for sixty feet before flying horizontally on the power of its main engine.



ENSHRINING A "BRISFIT." This Bristol Fighter, "Biff" or "Brisfit," is one of a number of actual war-time aeroplanes now being transferred from Cardington to the new home of the Imperial War Museum, in the old Bethlem Hospital, Geraldine Mary Harmsworth Park, Southwark.

Twenty-five Years Ago

(From "Flight" of December 17, 1910.)

"I read of many interesting things in your paper, but have never come across any device that actually serves as a brake on an aerial machine while in flight. On many of the present aeroplanes this would be unnecessary, but when there are a number of them together, as at a flying meeting, an air-brake would be a valuable accessory, and might avert serious collisions."—[Reader's letter.]

Lighting On It

Digging operations in connection with installation of night landing equipment at Bulawayo aerodrome have led to the discovery of gold in the proportion of 6 dwt. to the ton.

The Tatsfield Accident

Viscount Swinton, Secretary of State for Air, has sent a message to the Belgian Minister of Transport expressing his deep regret at the loss of lives in the accident at Tatsfield.

Car Firms and Aircraft

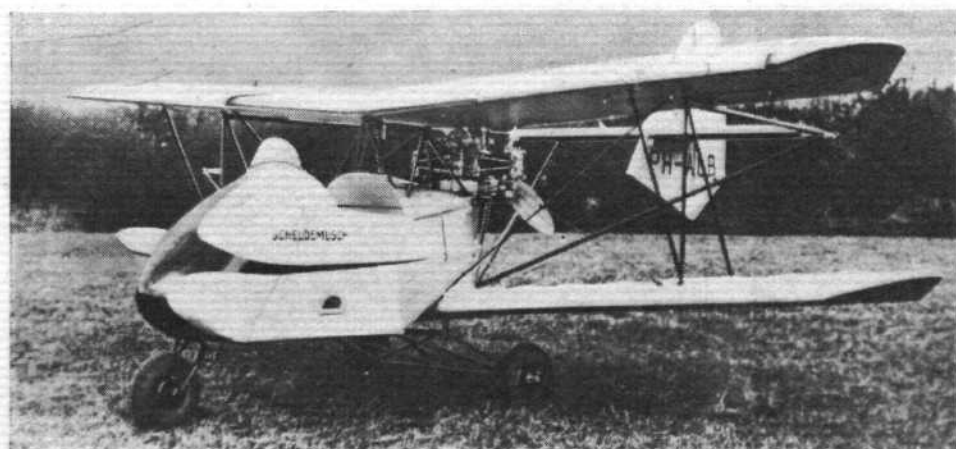
It is interesting to observe, among recent registrations of new companies, that another well-known car firm—that of Riley—is seeking a footing in the aviation industry. Riley Aircraft, Ltd., was registered as a private company, with a nominal capital, on December 10.

A "Pou" Prover

Flt./Lt. A. M. Cowell has been appointed to test "Poux du Ciel" on behalf of the Air League. Any "Pou" constructor who would like Flt./Lt. Cowell to ascertain if his product will fly, and if so, in what manner, should write to Air Commodore J. A. Chamier, at 19, Berkeley Street, W. 1.

LZ-129 Structure Complete

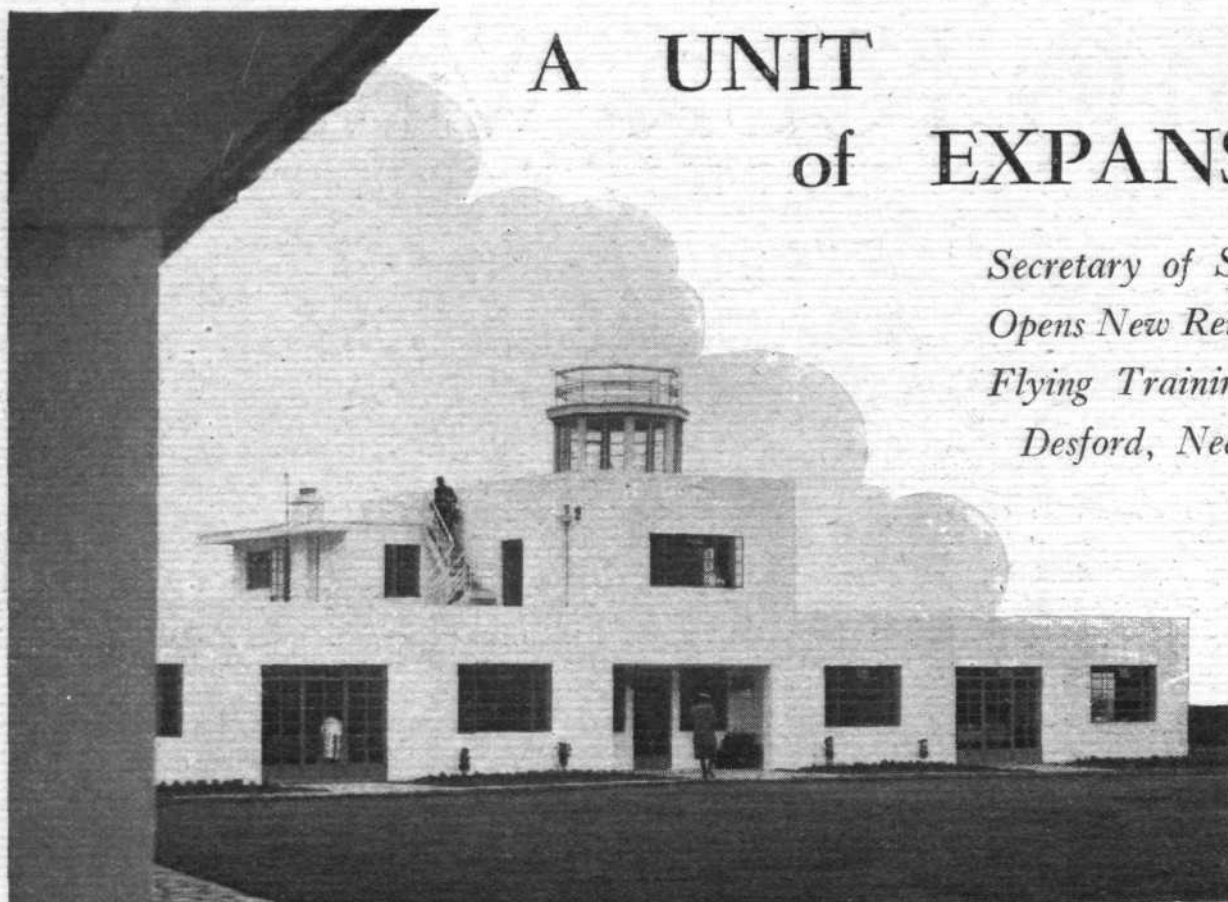
Although, structurally, the airship LZ-129 is complete, it will take a fortnight to admit her gas. If all goes well she should take the air on January 20, bearing the name, rumour has it, of Adolf Hitler. By the beginning of May she should be in service.



VIDAL-INSPIRED? Safety (and perhaps comfort) at the expense of performance seems to be the idea behind this Dutch effort, recently tested at Flushing, Holland.

A UNIT of EXPANSION

*Secretary of State for Air
Opens New Reid and Sigrist
Flying Training School at
Desford, Near Leicester*



The attractive new mess block was the scene of the inaugural luncheon. (Flight photograph.)

ONLY three months ago Desford aerodrome, near Leicester, was far from being in a fit condition to house a large flying training school, yet last Friday Viscount Swinton of Masham, Secretary of State for Air, was able to fly there and to open an extensive and completely modern establishment instituted by Reid and Sigrist, Ltd., for the primary instruction of regular and reserve pilots of the R.A.F. The school is actually the ninth of thirteen of its kind which are being set up in connection with the Air Ministry's expansion scheme; the remaining four will be operating, it is hoped, within two months.

The story behind the development of the Reid and Sigrist school tells of extremely hard team-work—hampered, incidentally, by ten inches of rainfall—by Reid and Sigrist, Ltd., The Fairby Construction Co., Ltd. (who are responsible for the highly attractive and eminently comfortable buildings), and by the En-Tout-Cas Co. This last firm has effected the rapid rejuvenation and extension of the original 42-acre aerodrome. As at present in use, the area measures 1,000yd. by 950yd., but, even so, Reid and Sigrist, Ltd., have thought it advisable to acquire another fifty-six acres to permit future extension.

The school is six miles from Leicester, 400ft. above sea level, and is served by good roads. A large hangar measuring 220ft. by 70ft. (with sufficient door clearance to permit the housing of all types of aircraft), administrative buildings, mess block, and residential bungalows comprise the main buildings, every one being centrally heated and soundproofed. The north wing houses the parachute rooms; a modern ambulance and fire tender are kept in the south wing, which contains, in addition, the first-aid room and the transport bay, and there are four large lecture rooms in the administrative block besides five offices and a photographic department. Quarters consist of six-roomed bungalows, and each pupil is allotted a room of his own. In the clubhouse are a dining-room, a lounge, a spacious hall and a modern kitchen. Eight acres have been devoted to a sports ground, gardens, and a car park.

Provision is made for instruction in administration, law and discipline, airmanship, navigation, armament, photography and signalling. Seventeen yellow D.H. Tiger Moths (Gipsy



Viscount Swinton speaks appropriate words for the benefit of the news reel cameraman. He flew to Desford in a D.H. 89 of No. 24 (Communications) Squadron. (Flight photograph.)



This refuelling unit built by Thompson Bros. (Bilston), Ltd., contains 350 gallons of petrol, and 50 of oil, the former being delivered by an engine-driven pump. (Flight photograph.)

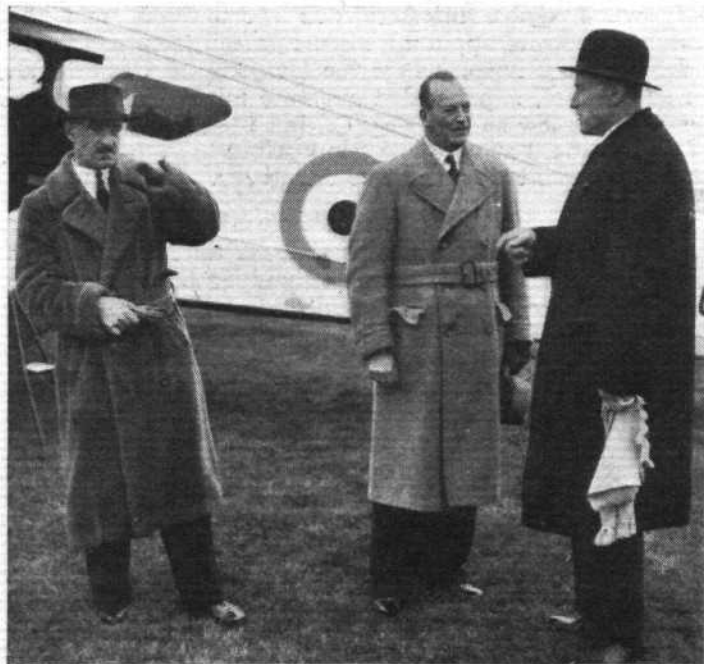
Major), all fitted with Reid and Sigrist blind flying instruments in both cockpits, form the school's flying equipment. For rapid refuelling a mobile unit built by Thompson Bros. (Bilston), Ltd., is provided. This contains 350 gallons of petrol and 50 of oil, the petrol being delivered by a mechanical engine-driven pump.

Mr. George Lowdell has been appointed chief instructor, and is assisted by Flt. Lt. Caruthers, Flt. Lt. Hawes, Flt. Lt. Du Cray, Flt. Lt. Tindall, and Mr. A. G. Bulmore.

Twelve of the new Tiger Moths were paraded last Friday when Viscount Swinton landed in a Service D.H. 89, escorted by a Hart. Instructors and pupils—the first draft of the latter numbers about thirty—stood by their machines for inspection, on the completion of which Viscount Swinton was



The first batch of pupils numbers about thirty. They were probably the only warm people on the aerodrome last Friday! (Flight photograph.)



Viscount Swinton chatting, on arrival in a D.H.89, with Sqn. Ldr. Reid and Mr. George Lowdell (left), the chief instructor. (Flight photograph.)

conducted on a tour of the aerodrome buildings. It was impossible not to notice the interest he took even in the smallest items of equipment. Subsequently he attended a luncheon in the clubhouse, to which a number of notable Leicestershire and Service officials had been invited.

During the course of this luncheon Sqn. Ldr. Reid, who has been closely identified with the development of the school, said that already a number of pupils was ready for solo. He was of the opinion that Great Britain headed the world in blind flying, and was particularly proud of the blind roll which was being done at the school.

Viscount Swinton's Speech

Viscount Swinton, in his speech, expressed the hope that the formation of the school was an example of the rapidity and efficiency which would characterise the whole of the Air Ministry's expansion scheme. Had the R.A.F. been forced to rely only on the regular training schools, he said, their job could not have been done. Already the Service was deep in the debt of Sqn. Ldr. Reid, and he hoped that it would stand still deeper. Nothing, he said, mattered so much as peace, and the only way to ensure the peace of the world was to make it certain that any one mad or criminal enough to take a chance on war would find that it was not worth while.

The luncheon over, Viscount Swinton hastened away to Catterick by air. In our new Air Minister we have, obviously, a man of tremendous energy and enthusiasm for his difficult job.

THAT CHRISTMAS GIFT PROBLEM

FOR many people the problem of what to give friends in the way of Christmas presents still remains unsolved. *Flight* suggests that an extremely acceptable gift for anyone interested in the Royal Air Force would be a copy of the book, "Squadrons of the Royal Air Force." Its price is 7s. 6d., and a very full description of its contents appeared in last week's issue of *Flight*, while further details will be found on page 646 this week.

Another suggestion is that the intending giver should examine some of the very attractive articles supplied by the Goldsmiths and Silversmiths Co., Ltd., of 112, Regent Street, London, W.1. This firm, well known to readers of *Flight* as makers of presentation scale-model aircraft in silver and other materials, offers a wide selection of articles of varying degrees of utility and luxury, ranging from wrist watches to cocktail shakers.

Cigarettes are always acceptable, and Players' market an exceedingly attractive series of gift packings of their cigarettes and their "Airman" and other tobaccos.

Eminently suitable to stand hard outdoor usage are the

"Aeroplane" wrist watches sold by G. and M. Lane and Co., Ltd., of 24-26, Ludgate Hill, London, E.C.4.

Something quite different again is the Dr. Curry's Weather Prophet, a useful and reliable little weather forecasting instrument sold at 7s. 9d. post free, or 8s. 3d. c.o.d., by Simmonds Aerocessories, Ltd., of Shell-Mex House, London, W.C.2.

Finally, there is an endless number of ideas to be found among the products of the retailers of aeronautical clothing, details of which were given in the accessories section of the British Industry Number of *Flight*, dated December 5.

Alvis Developments

AT a meeting held in Coventry last week, the Alvis Car and Engineering Co., Ltd., obtained the consent of the shareholders to an increase of capital from £300,000 to £500,000. This, as foreshadowed in *Flight* of December 5, is a preliminary to developments in the aero engine field.

THIS ICE BUSINESS

A Problem Which Must be Faced : The Probable Effect on Winter Passenger Bookings : Some Causes and Methods of Prevention

WHETHER or not the general public has been properly aware, during recent years, of the very real dangers of ice formation, they have certainly been educated, and possibly frightened, during the past week or so.

On at least two days some services to and from the Continent have been cancelled because of the prevalence of ice-forming conditions, and the Tatsfield tragedy was popularly, though possibly erroneously, attributed to this trouble, which may have been a contributory cause. On that day, however, the wind was strong and very variable, and the pilot of the Savoia-Marchetti may have imagined himself to be over Croydon, with a comfortable ceiling, when the machine struck. Furthermore, D/F bearings at the period of sunset are usually very unreliable. There are, in fact, a dozen good reasons which do not necessarily include this supposition, though the presence of an ice-forming layer would have limited the pilot in his range of altitude.

Several times during the past year *Flight* has published articles dealing with the meteorological conditions in which ice formation was possible and with the various methods of prevention or cure. In the issue of February 21, for instance, the results of an enquiry instituted by the meteorologist of the American air line, Transcontinental and Western Air, were published in full, and a little over a month ago we gave a *résumé* of a paper read by Mr. Lockspeiser describing the work done at Farnborough. This work has culminated in the development of a chemical method of combating the danger, and the equipment is being produced on a commercial basis by the Dunlop Rubber Company, and will shortly be fitted experimentally to at least one of the machines owned by Imperial Airways.

Preventive Measures

Previously, the Goodrich Company had developed a mechanical de-icer, whereby a series of rubber tubes along the leading edges could be filled with air by means of an engine-driven pump, the accretion being broken up and subsequently blown away by the airflow. This de-icer has been fitted to a number of machines on the American air routes, and also to two, at least, of the Air France fleet. Deutsche Luft Hansa has experimented, too, with a heating system, but, apart from the weight of the necessary equipment, it has been proved that the amount of heat, and, consequently, of power, necessary to keep the vital points clear of ice was very considerable. R. A. Lister & Co., of Dursley, are experimenting with a metal-hardening process which may make metal surfaces incapable of holding a deposit of any kind.

The facts remain that another critical period will have passed before the problem will have been seriously tackled by operators as opposed to research workers and manufacturers, and that all the radio and blind-landing devices in the world will be virtually useless so long as this danger remains with us. Before next winter *all* transport machines must be equipped with some absolutely reliable device for ice prevention. The general public will demand it, and the operators will find that the cost of such equipment will be a small price to pay for the added confidence.

At the moment, air travellers have been educated to the point of flying as regularly in winter as in summer, and this steadily developed confidence must not be thrown away. In fact, the operating companies cannot afford to throw it away. Now that air travellers have learnt of the ice-accretion danger they will watch for formation and suspect it as being the cause of every minor or major accident during the winter.

Last January, for instance, while flying in a D.L.H. machine to Berlin, the pilot of the Ju.52 found it necessary to hang about in the clouds near Tempelhof in the gathering darkness. Only one passenger other than the writer, who was on board, noticed the depressing fact that clear ice was forming on the leading edges of the wings and flaps. Each of us knew that in Central Europe ice had been known to form at the rate of three inches a minute, but the dozen or so other passengers either read books or slept. They must be allowed to remain as aloof and as confident in the future.

How, might the casual person ask, does the ice form and wherein lies the real danger?

It was explained in the article published in January, and also last month by Mr. Lockspeiser, that the temperature range favourable to such formation was very narrow—within a few degrees below zero. Dangerous ice formed only when visible moisture was encountered, and the heaviest deposits appeared when rain fell from a warmer stratum into a region where the temperature was critical. In actual fact, super-cooled moisture might exist in temperatures as low as -20°C ., but the moisture content of air decreased at very low temperature to such an extent that the deposit would not be dangerous.

Accurate Prediction

Obviously, therefore, it is possible for the Meteorological Office, with the aid of specially equipped balloons and so forth, to discover the likelihood and level of ice-forming conditions. Hence the cancelled services already mentioned. But air services, as far as the serious passengers are concerned, might as well be cancelled throughout the winter as on different and unpredictable days. Since ice-forming conditions are critical, it might be asked: how is it that pilots cannot be warned to keep below or above a dangerous level? Simply because ice-forming layers are variable. One which may appear to lie safely at 1,500ft. might descend during the period of a flight. In order to get above such a layer the pilot must, in any case, climb through and glide back at the beginning and the end of a flight. In certain conditions ice forms very quickly indeed.

The dangers, of course, are many. The added weight may force a machine down to lower and dangerous levels—or even on to the ground. Since the ice forms mainly on leading edges, building itself forward and outward, it eventually spoils the aerofoil shape to such an extent that much of the useful lift is lost. Deposits on the airscrew will not remain there, but they may be flung off little by little in such a way that the airscrew will be put out of balance and either be broken itself or damage the aircraft structure. Finally, pitot heads and venturis may be frozen up, but the former can be electrically heated, and the latter can be replaced by engine-driven pumps. Control hinges and the like form a potential source of trouble—but not usually of serious trouble, and, apart from careful design, very little can be done to prevent any difficulty that might occur.

A Really Notable Book

GREAT interest has already been aroused by the appearance of *Flight's* book, "Squadrons of the Royal Air Force," and, indeed, it would be strange if such a splendid collection of air photographs did not arouse wide enthusiasm. These are the days of Air Force expansion, and thousands of young men are offering themselves to the service of their country in the air. Boys at school are longing for the time when they can enter Cranwell or Grantham or Halton, as the case may be. This book will tell them all about the subject, and no more welcome Christmas present could be given to man or boy.

Private Flying



Topics of the Day

Why Not a Seaplane Club?

IT has always been a source of amazement to some people that the seaplane or flying boat has not found greater favour with the private owner. I believe that a seaplane club, provided that its headquarters were suitably placed, would attract a sufficient number of flying members to make it a sound proposition.

The lack of a training centre, of course, largely explains the lack of prospective owners, and the last will, again, explain the lack of suitable machines.

It is, though, quite obvious that a seaplane, or even a flying boat, of the size likely to attract the owner will be limited in its use, since only the really big boats can be considered as being capable of surviving anything like a sea. Nevertheless, there are stretches of sheltered water in this country where even a "plaything" would provide a tremendous lot of instructive and extremely pleasant flying for enthusiasts.

Of what real value, after all, are the large numbers of purely racing boats which are to be seen every week-end throughout the season in the Solent and elsewhere? Yet I consider sailing to be one of the most attractive of pastimes, simply because, as in the case of flying, one can never learn everything that there is to be learned.

Combining Pastimes

SEAPLANE or boat flying would combine many of the attractions of both, and no one will deny that coastal areas are the most attractive places over which to fly.

There must be hundreds of keen sailing men and women who would jump at the chance of doing some flying, and for them, at least, there would be very few new problems connected with the handling of aircraft on the water. For the somewhat bored landsman club pilot these problems would be likely to renew a fading interest in flying.

If such a club was run on a sufficiently magnificent scale there is no reason why one or two sailing dinghies, or even larger boats, should not be available for the entertainment of qualified members.

A little sailing experience would, in any case, provide a very excellent instructional foundation for those who had previously handled neither boats nor aeroplanes. A racing yacht when "running" in a fickle wind and on the very point of gibing has very much in common with an aeroplane which is on the edge of the stall. To a very large extent one sails by feel and sound rather than according to a book of rules, and the accurate judgment of wind and tide needed when bringing a yacht up to a mooring is certainly no less than that required to pull off a "spot" landing.

A Malayan Example

UNDOUBTEDLY both the membership fees and the flying charges would be rather higher than those to which we are accustomed in the case of ordinary clubs, but the yachtsman, at least, is quite used to the business of paying heavily for his pleasure, and there is no reason to suppose that moderately high charges would deter prospective members. The only question is whether there are a sufficient number of interested people.

Forced by circumstances to think only in terms of seaplane flying, a group of enthusiasts long ago formed the Singapore Flying Club, and this club has been using D.H. Moths on floats for a number of years.

The combination of a tough climate, the effect of sea water, and of the fact that Singapore is far from Stag Lane, had caused their maintenance bills to be on the high side as we think of such things, but the club has kept going and has suffered very few serious immersions. Remembering that a light aeroplane on floats is a tricky affair, and that the machines have been low-powered when judged by modern standards, the fact that the club has carried on at all is at once a tribute to persistent enthusiasm and instructional skill.

The Private Owner's Ideal

FOR the private owner, of course, the ideal type would be an amphibian. Only one of these, so far as I know, is at present privately owned in this part of the world, and this particular machine is a much larger and more powerful affair than would be considered for a moment by the average well-to-do individual.

We all know that amphibian gear is heavy and that it can only be considered as so much wasted payload, but the advantages of such a type are immense. The Sikorsky S.43 has a ratio of gross to tare weight which would not disgrace a land machine, as well as an extraordinarily good performance. Though the S.43 is a large and expensive commercial machine, its figures suggest that a small amphibian could be produced nowadays with a general performance which would be very little poorer than that of a normal landplane.

The whole point is that the small demand has not made it worth while for any manufacturer to spend a lot of money on a prototype. The appearance of a seaplane and flying boat club might bring a few prospective owners into the daylight, and the manufacturer, if not overburdened with Air Ministry orders, might consider it to be a fair speculation. Certainly, without the training ground, the best and cheapest amphibian in the world would be rather in the position of a Rolls-Royce which had suddenly been deposited in Tibet.

INDICATOR.

Private Flying**FROM the CLUBS***Events and Activity at the Clubs and Schools***WILTSHIRE**

Three pupils are taking blind-flying instruction. During the week ending December 11 school machines flew 23 hr. 55 min.

BRISTOL

Although the Airport will remain open for traffic throughout the Christmas holidays, the Club will be closed on December 24, 25 and 26. Mr. P. R. Scott became a pilot member last week.

LONDON

A preponderance of "weather" kept flying time for last week down to 15 hr. 5 min. The London Aeroplane Club's Puss Moth, incidentally, has been sold to Mr. M. W. Bartlett, of Nyasaland.

C.A.S.C.

Nine members attended on Sunday. Flying times were 1 hr. 20 min. solo, and 5 hr. 30 min. dual. The C.O. of the Cambridge Squadron reported that his unit is six members strong.

ROYAL AIR FORCE

The date of the Royal Air Force Flying Club's Annual Display, which will take place as usual at Hatfield Aerodrome, has been fixed for Saturday, June 6. Wing Cdr. E. R. Pretymann, A.F.C., recently joined the Club.

SOUTH COAST

Nearly 20 hours' flying was put in last week. Membership now exceeds 190, and new members include Mrs. Strong and Messrs. Strong and Marshall-Jones. There will be no flying on Christmas Day, but the clubhouse will be open till 2 p.m.

CAMBRIDGE

Another Gipsy Moth (G-AACD) was purchased last week, bringing the total number of school and Club machines up to eight. Messrs. Messiter and Smith should complete their instructor's courses this week. Flying times for the week ending December 14 totalled 34 hr. 20 min.

HANWORTH

A new private owner, Major Holden, is housing his Monospar in the Club hangar. The lectures, which are being held three times a week, and deal with aircraft, engines, and the theory of flight, are attracting more and more pupils. New members are Miss MacLaren and Messrs. Raymond and Bailey. Flying times last week amounted to 28 hr. 55 min.

There will be no tuition on Christmas Day or Boxing Day, but the normal arrangements will prevail on all other days.

LEICESTERSHIRE

Mr. R. G. V. Lillie took his "A" licence during November. There was night flying on three dates, and the Club acquired a new B.A. Swallow (G-ADXH) which is proving highly popular. About 100 members and their friends enjoyed a dance in the clubhouse on November 15.

NORFOLK AND NORWICH

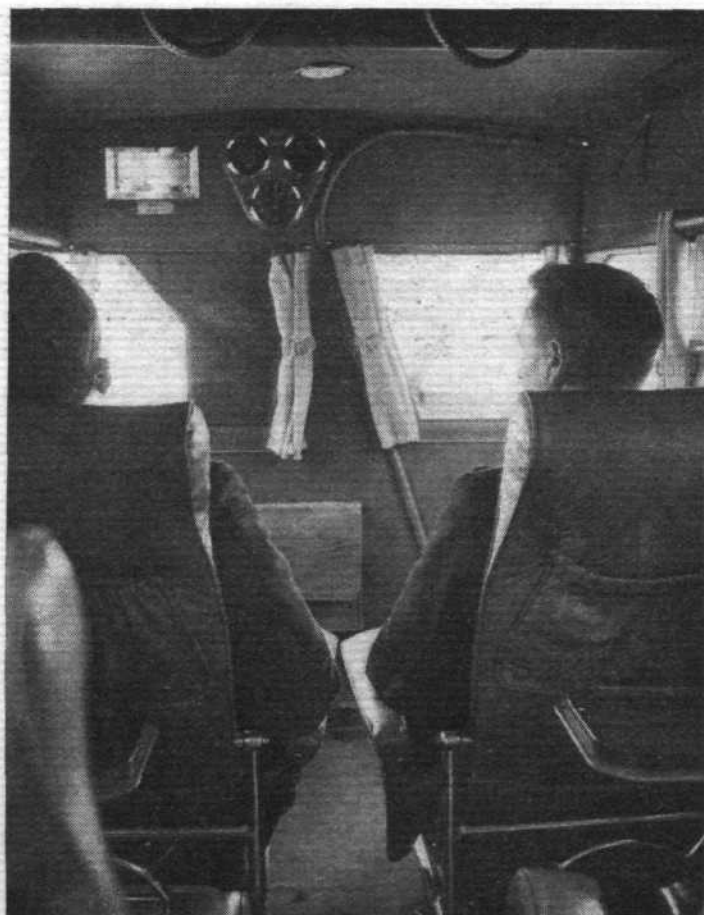
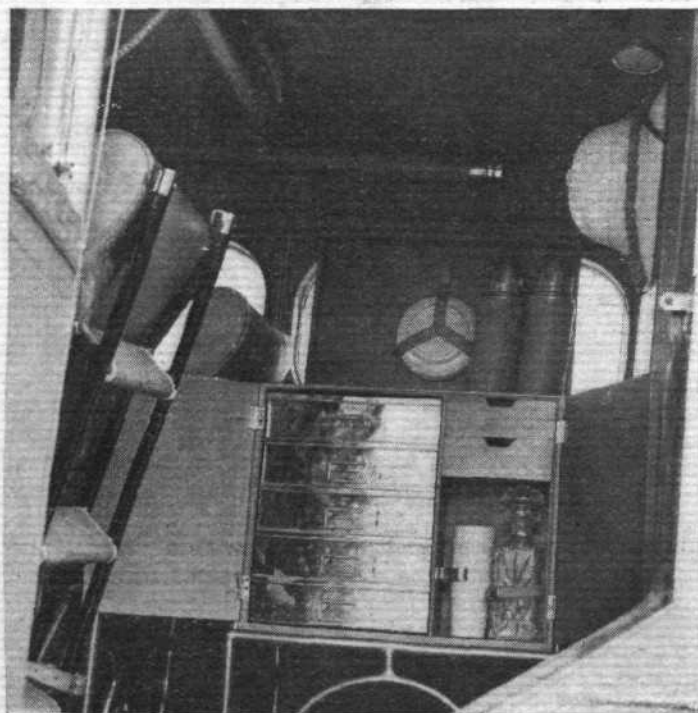
Mr. A. L. Flowerdew passed the flying tests for his "A" licence last week. Visitors by air included Mr. John Rogers in a B.A. Swallow, and Mr. John Grierson in a similar machine. His lecture on "The First British Arctic Air Route Flight" was well attended by members. The Club will be kept open during the Christmas holidays, but flying will be suspended from December 23-31 inclusive.

BROOKLANDS

Club flying times fell last week owing to weather conditions, although on Sunday alone 22 hr. flying was done. Messrs. Grant and Cheer went solo, and Capt. Birkett, of Birkett Air Services, completed a course of instrument flying. Mr. J. D. S. Allan's *Pou*, which has been built in the College of Aeronautical Engineering, was completed and has been making trial runs, although the condition of the aerodrome was not entirely suitable. The latest idea of the progress committee is an equestrian school, the members of which include the managing director and general manager. The school will be closed from December 22-30.

CINQUE PORTS

In spite of the handicap of last week's bad weather, the Club still has time to reach the 2,000 hr. mark for the year, thus constituting a new record. Mr. Sooren Tobalian, who has flown from Iraq, has been weather-bound at Lympne for three days. It is understood that he is on his way to Hamble, where he will take an instructor's course before flying home. Mr. Garnos Williams, late of No. 25 Squadron, and now of Imperial Airways, and an old friend of the Club, was a visitor during the week end. The Christmas dance arranged for Friday, December 20, bids fair to be one of the most successful yet held.



LUXURY PRIVATE OWNERSHIP. Two views of the interior of the D.H. 89 which the De Havilland Company has just completed for H. H. the Maharajah of Jammu and Kashmir. On the left is seen the rear portion of the cabin, containing a cocktail and luncheon cabinet. Also noticeable is one of the attachments for carrying sun helmets and, on the back of a seat, the step-ladder for entering the cabin. The view on the right shows the "expanding" arm-rests which, while permitting gangway room, allow the occupants of the seats plenty of width when nobody is actually passing. The cabin is luxuriously upholstered—by Rumbolds—and all windows have blinds. The machine is finished in a biscuit shade. (*Flight* photographs.)

CASTLE BROMWICH

Dual and solo times for the two weeks ending December 12 were 17 hr. 5 min. and 6 hr. 55 min. respectively. Messrs. A. L. Such and I. T. Williams became members.

CARDIFF

High winds prevented Club machines from flying more than 8 hr. 40 min. last week. Two "A" licences, however—those of Mr. C. F. Upham, and Mr. R. R. Smith—came through.

REDHILL

Mr. Blount took his blind-flying certificate, and Mr. Caws passed his W/T examination last week, during which 45 hr. 5 min. flying were logged. With the exception of Christmas Day, the Club will be open over the holidays.

LINCOLNSHIRE

A number of members of the Lincolnshire Aero Club have flown the B.A.C. Swallow and the Aeronca during the past fortnight. An attendance of 450 was recorded at the fourth annual dance last Friday. There will be a Christmas party in the Clubhouse on December 19.

HULL

An interesting competition, open to all flying members who have gone solo since January 1, 1935, has been arranged for the morning of Boxing Day. The winner will hold the Blackburn Cup for one year. The New Year's Eve Dance looks like providing the finest evening the Club has held.

PORTSMOUTH

The Portsmouth Aero Club was registered as a limited company on December 10.

High winds affected flying last week, but a total of 27½ hr. was reached, 19 hr. 25 min. being solo. Mr. A. Fleming qualified for his "A" licence, and Capt. E. A. Remnant joined the Club.

YORKSHIRE

There was an encouraging attendance at the film show on December 8, when Mr. Adams exhibited films of aeronautical interest. A second show is being arranged for one Sunday late in January, when it is hoped that *Wings over Africa* will be available. Fourteen and a half hours' flying were recorded last week, and Mr. C. H. Barker, a pupil under the Air League Young Pilots' Fund scheme, passed his "A" licence tests. There will be a children's party at the Clubhouse on December 30 from 3 p.m. to 6 p.m., and a dance on January 25 from 8 p.m. till midnight.

COVENTRY AVIATION GROUP

The Mayor of Coventry was in the chair at the second annual general meeting of the Coventry Aviation Group held on November 21; the Deputy Mayor was also present. The annual report showed that the Club's membership had increased during the year from thirty-four to ninety-six, of which sixty-five were flying members. Flying hours showed an increase of over 200 per cent. above the previous year. Ten members had gone solo, and six had taken their "A" licences. The purchase of another machine has become necessary. The Mayor of Coventry said that when the municipal airport was opened, the Group would come into even greater prominence. A lantern lecture by Mr. C. Kenney on "Aerial Photography" followed the meeting.

Messrs. H. L. Brooke, B. Faulconbridge and P. S. Croall have recently enrolled as flying members.

AIR SERVICE TRAINING

Twelve hundred hours' flying was recorded by A.S.T. during November in face of handicaps imposed by the weather. It was impossible for the twenty-six R.A.F. reserve *ab initio* pupils to complete their training by the scheduled date. With the coming of better weather at the end of the month, however, all finished their training and a new batch of twenty-seven pupils has taken their place. Three civilian students—Messrs. R. T. Needham, P. W. Kennedy and E. Rotherham, left during the month to take up appointments as first officers with Imperial Airways, Ltd. Mr. J. N. Wilson, who flew from Australia in his own machine to take a blind-flying course, qualified for his certificate. Mr. E. G. Parsons took a blind-flying instructor's course, and Messrs. Soule, Naralkar and Babar Mirza left for their home countries. Mr. C. W. Wood took his "A" and "C" ground engineer's licences. New pupils include Mr. Hodgson and F/O. Tomkins for the instructor's course; Mr. de Satge and Mr. O. F. Thomas, of Australia, for the navigator's licence; Mr. Whateley for the "B" pilot's licence; Mr. Uguhart for the long course and Mr. Druce for the ground engineer's course.

The School trophies won this year were presented to the following: Mr. Roberts, blind flying; Mr. Raubenheimer, of South Africa, Gardner Flying Trophy; and Mr. Vereker (previously a complete "landlubber"), the Minchin Yacht Cup.

The School Fleet has again been augmented by the two latest type (643) Avro Cadets, and two more will arrive early in December. On the 29th, a Short Calcutta flying-boat (Jupiter engines) arrived for the purpose of training Imperial Airways pilots. A second Calcutta, fitted with Siddeley Tiger engines, will arrive at the end of the year, and the first two trainees (both of whom have already taken other courses at A.S.T.) reported in early December.

CARLISLE

On Monday, the first good day for several weeks, Mr. Prescott and Mr. Hobbs went solo. The weather has been so bad, in fact, that only 12 hr. 35 min. have been flown this month. The Club is starting a magazine with the title of *Incidence*, and the first number should be out in January. Notes from other clubs addressed to Editor, *Incidence*, Border Flying Club, Ltd., Carlisle, will be welcome. Miss N. Gray and Messrs. R. E. A. and M. B. Hughes became members last week.

Gliding Club Registration

THE Federation of British Gliding Clubs has now prepared a scheme for the registration of gliding clubs as of limited liability for the modest fee of £3. The scheme is available to all clubs joining the Federation. Incidentally, clubs with less than twenty-five members are eligible for enrolment. The address of the hon. secretary is Lady Place, Sutton Courtenay, Berks.

Lord Sempill's Puss Moth

ROLLASON AIRCRAFT SERVICES, LTD., announce that they have just completed, at their Hanworth depot, the full overhaul of Lord Sempill's Puss Moth. The machine is fitted with wireless, Sperry directional gyro, extra tank in the cabin, landing light, cartridge electric starter, metal propeller and wheel spats.

The engine had done 1,009 hours since the last overhaul, and was found to be in exceptionally good condition.

This was the aeroplane which Lord Sempill used on his recent flight to Australia and back, the story of which he related week by week in *Flight*.

Organised Air Cruising

FOR some time now, Autocheques, Ltd., have been organising "one make" car rallies in addition to their better-known work of providing hotel accommodation for motorists and aviators travelling independently.

This firm is now arranging with Phillips and Powis Aircraft, Ltd., for an air cruise which will leave Heston on May 23, 1936, and will proceed via Baden-Baden to Budapest, Vienna and Nurnberg, returning to Heston on Whit Monday, June 1. The tour will be led by Flt.-Lt. T. Rose, and will be open to owners of Miles Hawk and Miles Falcon machines.

All the necessary arrangements for hotel accommodation, ground transport, petrol and oil supplies, official receptions, and so on, will be made by Autocheques, whose address is 33, Regent St., S.W.1.

Feasting the Record Breakers

ON Thursday, December 12, the directors of Parnall Aircraft and of Aircraft Exchange and Mart gave a presentation luncheon to Mrs. Jill Wyndham and Mr. D. W. Llewellyn at the Park Lane Hotel.

Sir Louis Vaughan was in the chair and, after he had congratulated the record-breakers, Lady Vaughan made a souvenir presentation. Mr. Llewellyn, in a brief speech of thanks, spoke of the fact that there were all too few English machines in South Africa, and that everyone out there was extremely interested in the prototype Hendy Heck. He produced one gem which may not have been heard before. A record-breaking pilot is one who works himself up from nothing to a state of extreme poverty.

During later—and impromptu—speeches it was mentioned that the first production Heck will be in the air during January and that, later, one machine would be produced every week.

Prizes for the Viceroy's Trophy

THE Aero Club of India and Burma announce that the Irwin Flying Fund have donated a further Rs. 1,000 for a third prize to be given in the Viceroy's Challenge Trophy Air Race which is to be flown on February 14 and 15, 1936.

The first prize will be the Viceroy's Challenge Trophy and Rs. 7,000; the second will be the Hari Kishen Das Challenge Shield and Rs. 3,000; and the third will be Rs. 1,000. The Speedolene Challenge Trophy and Rs. 2,000 will be given to the first "A" licensed pilot, wholly trained in India, to pass the post; the Wakefield Challenge Trophy and Rs. 200 will go to the pilot making the fastest time; and the first lady pilot will receive the Taxaco Cup.

In addition to the above prizes, Phillip and Powis Aircraft, Ltd., have offered to present a special prize of £100 to any pilot who is successful in winning the Viceroy's Challenge Trophy in one of their machines, provided the pilot has been trained *ab initio* at one of the flying clubs in India.

A RADIO COMPASS in ACTION

Testing the Standard R.C.5 : Unexpected Range, Accuracy and Simplicity

IN TENDED for use by the transport or charter pilot rather than by the private owner, the Standard R.C.5 radio compass is both light and compact when judged by air line standards.

The fact that the demonstration set is installed in a Puss Moth, leaving reasonable space for a pilot and passenger, even suggests that, in the more luxurious type of private owner's machine at least, the equipment, which weighs only 45 lb., would not be out of place. Furthermore, it can be operated with ease by a single pilot, though some of its more valuable uses on a long flight would necessitate plenty of space.

The Standard automatic radio direction finder consists of a receiver with a wavelength range of 700-1,700 metres, to which h.t. current is supplied by a rotary converter, a remote control unit which can be placed in any convenient position, a motor-driven rotating loop, earphones, and a card indicator with internal illumination, and a prism for easy reading. This indicator can, of course, be placed on or near the dashboard.

There are two principal methods of using the R.C.5. A pilot may either "home" on it, keeping the zero mark on the card against or near the aircraft lubber line, according to his drift calculations, or he may take two or three direct bearings on different known stations and so obtain a "fix," thereafter working out his course and taking further bearings at regular intervals in order to check his course. A series of bearings taken on a station at the terminal aerodrome at definite time intervals will provide what is known as a "running fix," and a pilot can then, with the aid of an ordinary C.D.C., obtain a calculated course on which to steer.

From the pilot's point of view the operation of the set is quite simple. He tunes in the receiver with a single milled knob, adjusts the volume on a milliammeter, moves over the D/F. controls, and reads off the bearing. If he is "homing," he may treat the card as a turn indicator or directional gyro dial—and in flight the card is almost entirely "dead beat."

Some Practical Tests

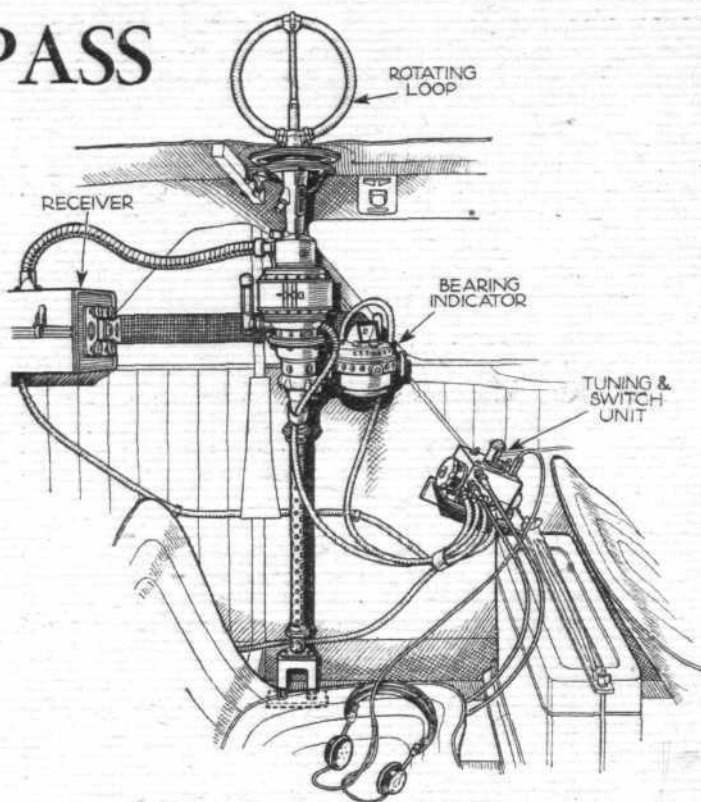
When obtaining a "fix," of course, the bearing is given in relation to the fore and aft axis of the machine, and the true compass bearing, taken at the same time, must be added to this in order to obtain the bearing of the station.

Although the tests made by *Flight* were, of course, made during the day, it is claimed that no sign of "night error" has been found with the normal equipment on readings taken from stations less than forty-five miles away from the machine.

In the course of these tests quite extraordinary results were obtained, though in one or two cases where no call sign or other indication had been obtained each station was identified simply by a species of deduction involving a knowledge of the approximate wavelength and the approximate bearing. A more complete knowledge would, however, remove the need for preliminary guesswork, and, in any case, later models will have a tuning dial properly graduated in wavelengths and capable of progressive movement. Needless to say, since all radiation travels by the shortest route, the indicated bearings of all stations are those of Great Circle courses from the point of reception. In the case of stations situated within a range of 500 miles this is, of course, a small matter. With a small machine the whole equipment is placed near the engine and the quadrantal error is necessarily fairly large. This was allowed for in the case of each bearing taken.

The first series of tests were made at Hatfield with the machine on the ground and facing true north. Droitwich station was used in the first place, and the corrected bearing was given as 293½ deg. Work with a protractor on an aviation map gave the true bearing as 295 deg. Borough Hill (Daventry) was, at the time, transmitting the regular meteorological report, and this bearing was taken as 309½ deg. A protractor again gave the true figure as 311 deg.

A station was then roughly identified as Moscow II, and the bearing obtained was 78 deg. This appeared to be rather wildly incorrect, and later, working on the respective latitudes



The R.C.5. direction finder installed in a Puss Moth.

and longitudes, a rhumb line course of 80 deg. was calculated, with a conversion angle of 15 deg., giving a Great Circle course of rather more than 64 deg. Although the distance between Hatfield and Moscow is something like 1,600 miles, an error of 14 deg. was obviously very large. Further researches suggested that the station was actually Warsaw, whose G.C. bearing from Hatfield is, within a degree one way or the other, 78 deg. Kalundborg (Denmark), registered as 48½ deg., has a G.C. bearing of about 51 deg. or a little more. Allowing for the fact that the initial bearings suggested that the machine was actually heading 1½ deg. from true North, these figures are extremely good, and are printed merely in order to give an idea of the range of the set. Obviously a pilot would prefer to work on stations which were nearer at hand. Radio Paris, for instance, was indicated as 153 deg., and this bearing appeared to be actually somewhere between 154 and 155 deg.

One of the most interesting results concerned a weak and temporarily unidentifiable station either on 139 or 318 deg. Researches on the southerly bearing failed to bring to light any station with a reasonably correct wavelength, and there remained only Reykjavik (Iceland), which lies on a G.C. bearing of 322 deg. from Hatfield. This station has the very small output of 16 kW.

Berlin was given as 76 deg. and the calculated G.C. bearing eventually worked out at 79½ deg.—a figure made up of a rhumb line course of 84 deg. 50 min. and a conversion angle of 5 deg. 20 min. Again, if allowance is made for the error, this figure is within 2 deg. of that indicated.

In order to reduce the minor mental calculations, the flying tests were made by the simple expedient of turning until a station, already tuned in, gave a zero indication on the direction-finding card. The compass bearing was then read and allowances were made for deviation and variation.

Radio Paris gave a compass reading of 165 deg., which, after 2 deg. and 11 deg. had been subtracted for the deviation and variation respectively, became 153 deg.—a figure identical with that obtained on the ground. Droitwich gave 308 deg., which, after adjustment, became 295 deg., coinciding exactly with the map bearing, though the Puss Moth was at the time flying at 2,500 ft. some two miles to the south-east of Hatfield. During the flying tests the card settled down with the same dead beat action that it had exhibited while grounded, and, in the case of a layout which placed the indicator in front of the pilot, the card could be treated as a sensitive turn indicator.

There is no doubt that the Standard Company's claim for an accuracy of ± 2 deg. is by no means an optimistic one. Since there are some twenty-six broadcasting stations in Europe, apart from other transmitting stations, within the wavelength range of the set, this radio compass can be considered as a very valuable aid to air navigation.

BUSINESS TRIP, 1935

Nineteen Thousand Miles in Two Months : The Pilot's Story of an Aerial Inspection Tour Carried Out by Representatives of a Petrol Company

AFTER some two months of preparation, during which time we informed the Air Ministry of our proposed itinerary, and obtained all but two of the necessary visas and permits, we left Heston in the Ethyl Export Corporation's D.H. Rapide G-ADAO on September 21, our purpose being to visit countries marketing the company's petrols and to inspect the Ethyl blending installations situated at various oil refineries between North Africa and Palembang, Sumatra.

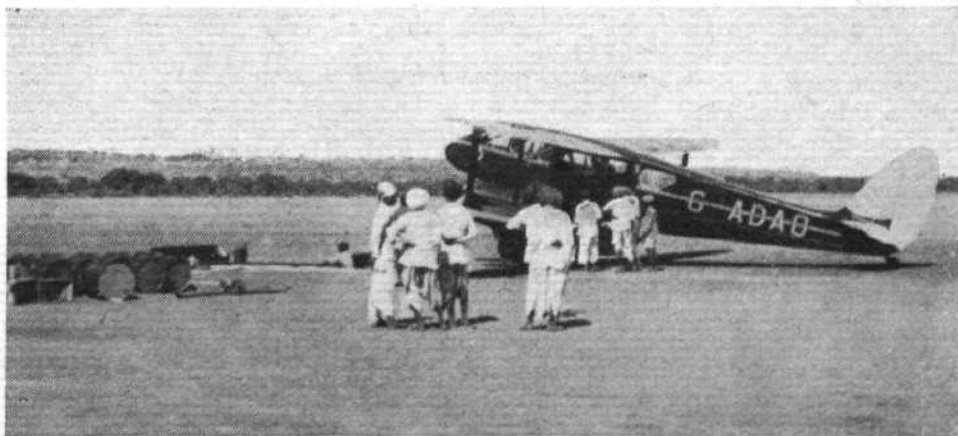
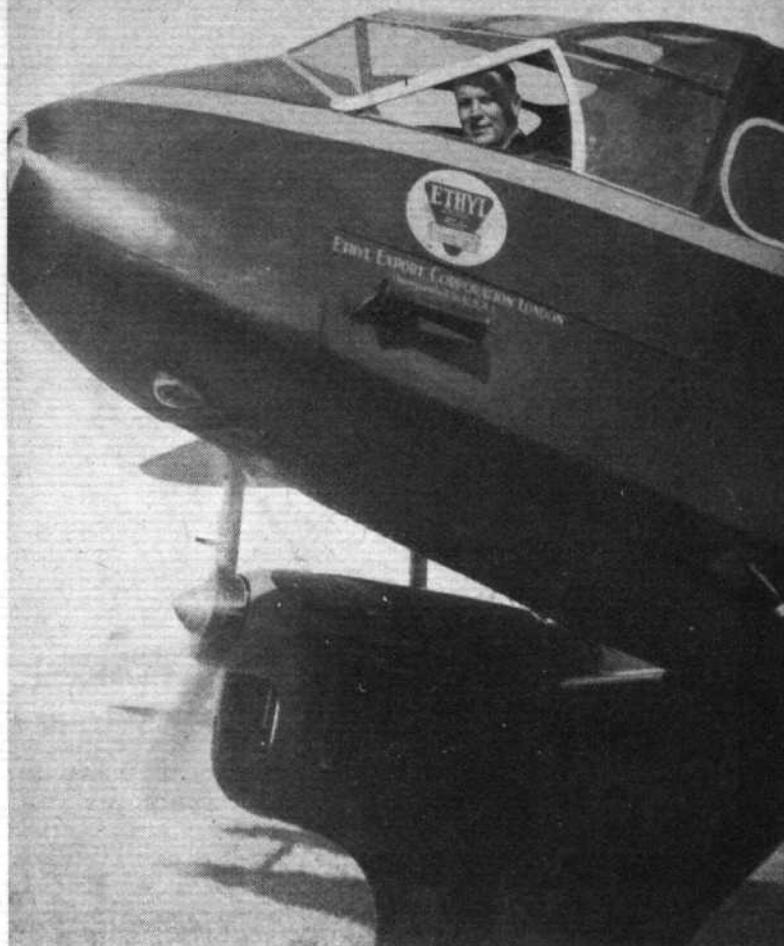
This machine is fitted with metal airscrews and blind-flying instruments, and carried for the trip a wide range of spares, including tyres and a complete magneto. We used Automobile Association strip-maps throughout, in conjunction with the very accurate and helpful Shell Air Route Schedules. We found an Air Log most useful in many ways, particularly because of some rather unexpected changes in local time, which caused every watch and clock on board to record different times on several occasions. An Air Log always has the last word where ground speed and fuel consumption are concerned.

In spite of all our preparations, we had to leave for Cairo without our flying permits and visas for Iran and Iraq. We had arrived there *via* Italy and Tunis, and thence followed the normal coast route. The aerodromes, with the exception of Sollum, were all good, and the staff on each most obliging. There were, however, numerous delays caused by "red tape"—a burden under which civilian pilots are evidently bound to suffer to an increasing extent. The culminating insult came at Mersa Matruh, where a multitude of forms was produced for signature. Among them was a declaration, to be completed in triplicate, to the effect that the Captain of the Ship had (a) noticed no rats on board, or (b) that no undue mortality had been observed among same.

Unimpressive

We were not impressed with the Biblical country between Gaza and Amman, which we found very hot and bumpy. The pipe line was easy to find in the exceptional visibility, but very boring to follow. We whiled away the time catching flies, dodging kite hawks (very lazy creatures), and, on one occasion, suddenly waking up to find a Fairey Gordon heading straight at us. Some of the R.A.F. landing grounds are difficult to locate, but the pumping stations are good landmarks, and much easier to see than Rutbah Wells. We were glad to reach Baghdad, which has a fine aerodrome (in dry weather) and palatial buildings.

It pays to follow the Baghdad-Basra railway, as dust is often encountered unexpectedly, and, without radio or drift indicator, the desert is not to be recommended. We

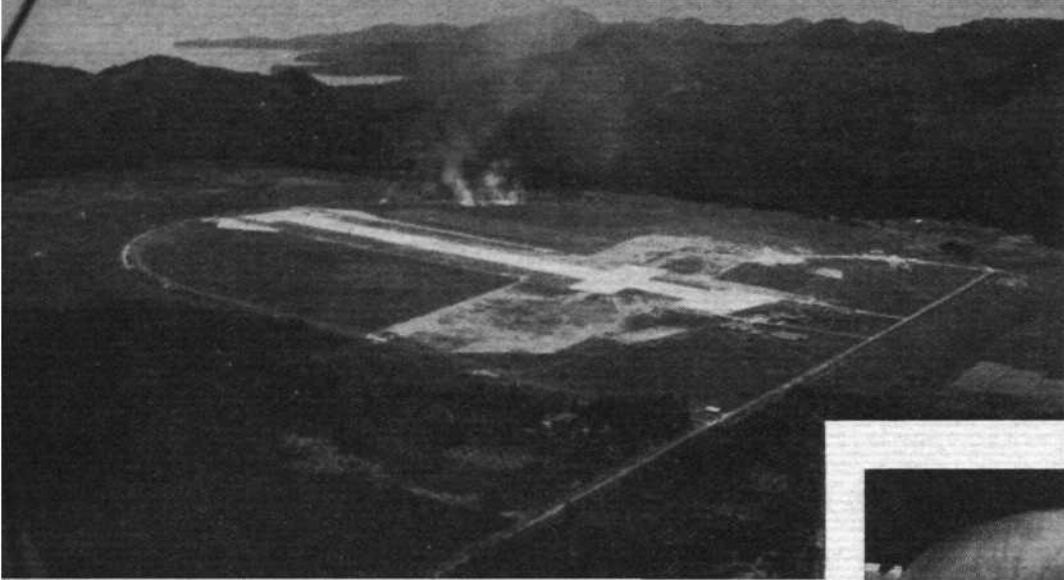


The Ethyl D.H. Rapide at Jodhpur. (Above) Mr. D. W. Lucke, pilot of the machine and author of this article.

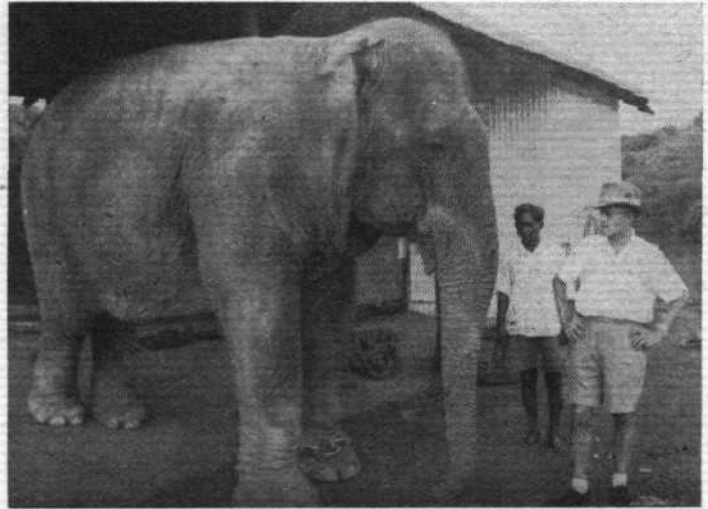
landed at Ma-Qil aerodrome, which is still under construction, but which will be very fine when completed. Here we found a system of picketing new to us, but which we often encountered farther East. A large wooden platform, complete with tethering cables, is placed under each wing, and on this are heaped sandbags. Its simplicity has much to recommend it, as no one but a boatswain can efficiently anchor an aeroplane with sandbags and rope.

From Basra to Calcutta the flight is most uninteresting. The Persian Gulf is desolate, and the Sind Desert only slightly less so. Every aerodrome on the Persian Gulf is on a promontory and therefore easy to locate, and, apart from occasional dust storms, the visibility is excellent. One can see the mooring tower at Karachi from a great distance. There is a convenient railway from Karachi to Jodhpur, which has a very up-to-date aerodrome, and from there to Allahabad and Calcutta navigation is made easy by the major rivers and hill ranges.

We had hoped to fly from Calcutta to visit a very interesting refinery in Assam, some 550 miles north-east of Calcutta. This we found to be impracticable in a Rapide, as the few landing grounds consist of golf courses and polo fields. The extremely uncomfortable railway journey



(Left) "Penang will eventually have one of the best all-weather aerodromes on the whole route." (Below) "In Assam... elephants are still used for the heavy work, and the original discovery of oil is supposed to have been made by an Italian hunter who noticed oil on the pads of the elephant he had shot."



there and back, of about eighty hours, was well repaid by a tour of the combined oil field and refinery, which have been literally hacked out of the jungle. We found the doctor there quite an expert on snakes; a reward is paid to the natives who bring them in. Elephants are still used for the heavy work, and the original discovery of oil is supposed to have been made by an Italian hunter who noticed oil on the pads of an elephant he had shot.

Continuing east from Calcutta we experienced very good weather, and found the aerodromes quite good except at Mergui and Victoria Point, the latter being unsuitable for anything but a very light aeroplane. Navigation is simply a question of following the coast from Rangoon onwards, and dodging occasional very heavy rain showers which give one a taste of what monsoon rain might be like. Penang will eventually have one of the best all-weather aerodromes on the whole route, and its present condition is vastly improved—if judged by photographs, taken some time ago, showing an Atalanta taking off, complete with bow-wave. At Penang, among other attractions, one can get some of the world's best snipe-shooting on the aerodrome.

Singapore Island, with its very big Seletar aerodrome, and even bigger new civil one, was a pleasing sight after miles of dense jungle and rubber plantations. The roads in Malaya greatly impressed us, but there is very little else of interest. We passed over Malacca, or "Sleepy Hollow" as it is known locally, but decided that we wouldn't like to live there. Singapore itself must be one of the most cosmopolitan places in the world, and one of the most interesting. We duly experienced a Chinese dinner, luckily under the generalship of a sympathetic host who knew something about the laws of expansion. The next day we watched the famous tame monkeys being fed in the Park.

Extra Tankage

Before leaving Singapore for Palembang we decided to place an order for auxiliary petrol tanks to be made locally. We felt that we should not care to land at Victoria Point again on the return trip, and also that extra range would enable us to cut out some of the very trying delays due to the abnormal amount of formalities which faced us on certain aerodromes. This decision led to some rearrangement of the cabin, as the tanks took up a lot of space, and it meant shifting two of our chairs into the luggage locker, while the baggage was stored amidships. The discomfort involved, however, was well compensated for by the fact that our daily mileage was greatly increased on the return journey.

The flight from Singapore, after one leaves behind the numerous small islands south of Singapore Island, is entirely over dense jungle, devoid of landmarks except for a few rivers which are sometimes difficult to identify. We dodged numerous very heavy rain showers, which brought the cloud right down on to the ground, and were relieved to see the town of Palembang and, to the south, the Moesi River with its two large refineries. The aerodrome at Palembang is merely a strip cut out of the jungle, and might be hard to locate under conditions of bad visibility. One can only land in two directions, and we found the wind across the aerodrome during the whole of our stay in Palembang. This was our turning-point, and, incident-

ally, the only aerodrome on the whole route where not even our passports were examined, much less our baggage. Incidentally, one of our passports had left England having twelve blank pages; these were all filled up before we reached Calcutta on the outward flight!

We began the return flight with the prospect of even better weather, at least as far as Karachi, and with the satisfying knowledge that we were gaining on the clock every day. Unfortunately, the weather let us down badly, and our departure from Penang was delayed thereby, while we were constantly being warned of unserviceable portions on various aerodromes; at Alor Star we were advised to remain on the runway while refuelling. Between Rangoon and Akyab, and shortly after leaving the former place, we discovered the only inaccuracy in our maps. It was found that our track had been laid off and marked with an error of 30 deg. Shortly afterwards, having found Bassein and Sandoway completely flooded, we ran into a storm on the Bay of Bengal which we could not dodge, and from which we could not turn back in spite of our increased range. We detoured well out to sea in order to be quite clear of the mountains, and eventually struck one of the three promontories south of Akyab, where the weather was clear enough to fly without instruments. Akyab was very sodden except for the Laterite runway, as it rained five inches that day. The next day, on starting up, we experienced our one and only engine trouble, a cracked distributor.

In Quarantine

The remainder of the return flight was without incident, bar a delay of five days in Karachi—where we had to obtain another visa to enter Iran, despite the fact that we had obtained permission to carry out the flight—and a lot of dust between Basra and Baghdad and Tripoli and Bengasi. We found the weather much cooler at Karachi, where we quickly discarded our shorts for something more substantial. From that point onwards we increased the amount of our clothes daily, and even the desert was cold. Our arrival at Jask was unexpected by the aerodrome doctor, and we were guarded by three sentries with fixed bayonets who would not approach us, nor would let us approach the aerodrome officials, until the doctor arrived to pass us as free from plague and other complaints! Incidentally, Friday is a holiday in Iran, and prices are doubled.

It was decided to visit Algiers on the way home and in-

spect the Ethyl blending plant there. This we did, and were pleasantly surprised to find that the whole character of the North African coast changes west of Tunis from "howling desert" to rolling country, quite well cultivated, and with large tracts of cork forests. The aerodrome at Algiers was a pleasant surprise, too. It has an air of efficiency about it, and is quite busy. From Algiers we flew west to Cape Tenes, where we struck north-west across the Mediterranean to Alicante, in Spain. Here we were met by three policemen who copied and re-copied the names from our passports during the time it took to refuel and smoke a cigarette, and who then gave up in disgust, handed us our passports and wished us "*bon voyage*." From that point of view Palembang and Alicante are the most refreshing aerodromes to visit on the whole route.

The next hop was to Marseilles, passing, *en route*, Valencia and Barcelona, the sight of which towns gave rise to much unmusical singing in the cabin of the already travel-weary occupants of the Rapide. At Marseilles we were delayed for a day and a half by the usual series of depressions in Central France. We finally got away, had a sticky trip to Le Bourget, and arrived at Heston the same afternoon, November 18.

We covered, in all, about 19,000 miles, during which our oil and fuel consumptions remained practically constant at about 0.5 gallons and 9.8 gallons per hour per engine respectively, at an average ground speed of 136 m.p.h. for the whole trip. We had one puncture, and the small ignition defect mentioned previously. Our only other trouble was caused by a series of stones on Sollum aerodrome—one large enough to dent the starboard spat quite severely.

We were very agreeably surprised at the easiness of the route so far as navigation was concerned, but over many stretches were thankful for having two engines. For any similar trips to be made next year the machine will be fitted with a drift indicator. Thermos flasks are invaluable, and in many cases it is preferable to have sandwiches prepared overnight rather than to be delayed by the preparation of a lunch, which often turns out to be inedible. Telegrams in some places are expensive, and one was often undecided as to the necessity or not of warning the next aerodrome of one's impending arrival. Our experience, however, was: "In case of doubt, wire ahead." It saves hours of delay, often on a bare landing ground, and under a hot sun.

THE BREGUET GYROPLANE

Large Payload Claimed : Some Technical Considerations : Test Flights to be Continued. By R. C. WOOD.

M. LOUIS BRÉGUET, the well-known French aeroplane constructor, has recently been making trials of a new machine which he has been developing, and which he terms a gyroplane. In this design the engine drives two rotors, mounted on a pylon one above the other and turning in opposite directions.

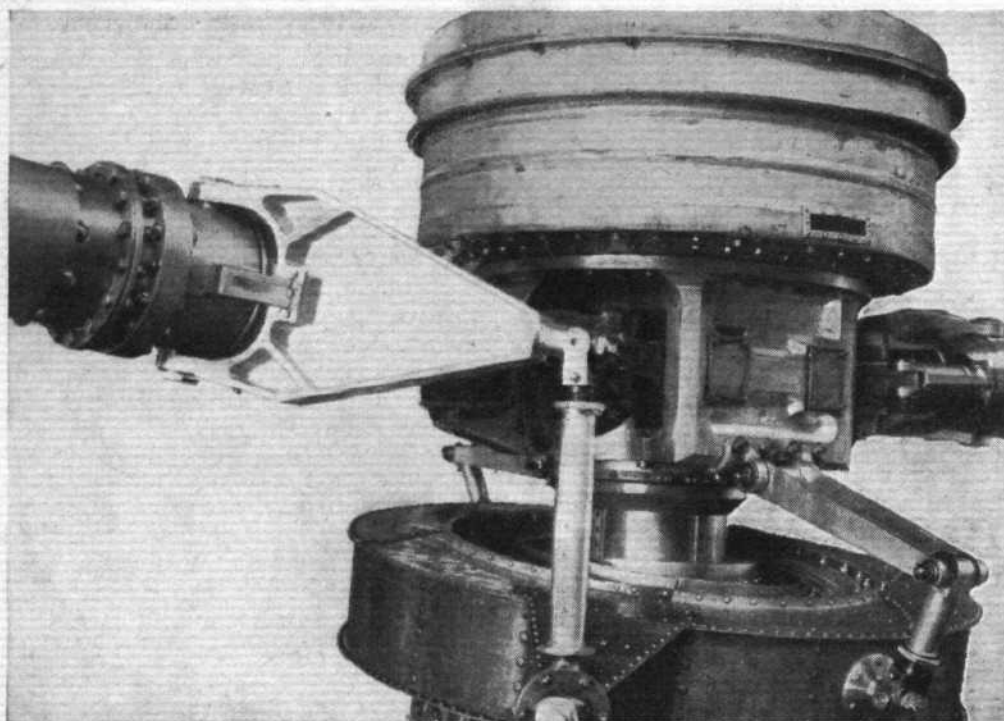
Recently, M. Bréguet pointed out that the speed of commercial aeroplanes is limited at present by the necessity of low landing speeds, and that for this reason they cannot be loaded at more than 150 kg./sq. metre (approximately 31 lb./sq. ft.) of wing surface at the maximum, notwithstanding that they may be equipped with the best-known aeronautical devices to aid their lifting power.

In order to obtain increased speeds, together with suitable landing qualities, for commercial machines, M. Bréguet calls attention to the formula represented by the gyroplane, which he believes can furnish an interesting solution to these questions. He points out that the gyroplane gives promise of not only attaining considerably higher speeds, but also of sustaining a much greater load per unit of lifting surface, which would furnish a substantial economy in the commercial operation. Furthermore, owing to the fact that the forward speed of the gyroplane is relatively independent of the rate at which the blades revolve, the machine can take off and land vertically.

The machine, as can be seen from the illustration, is an improved helicopter, in which the rotating blades, instead of the traditional airscrew, furnish the forward propulsion. As these blades are mounted on universal joints, they can also be used to ensure the directional and lateral control. The air pressures acting on them depend at each instant on the relative speed of the blades and on the incidence at which the latter are adjusted. These elements vary during each revolution of the blades, the speed of rotation being added at each half turn to the forward speed at which the gyroplane is moving. Unless precautions were taken, this fact would cause loss of stability. M. Bréguet has overcome the difficulty by attaching the rotor blades to their central hubs by means of universal joints mounted on two orthogonal (right-



The Breguet gyroplane under test. Its wheels are clear of the ground but it is being held down by picket ropes



A close-up view of the rotor head of the Breguet Gyroplane. The blades are carried on universal joints, and an incidence linkage is visible on the left.

angled) axes. Each blade is therefore free to adjust itself during each revolution according to the direction of the resultant forces acting on it, and can rise and fall independently, with an out-of-phase movement corresponding to the angle at which it is mounted. When the blades advance against the relative wind pressure created by the forward movement of the machine they are raised, and a contrary movement takes place during the succeeding half-turn when the blades recede before the same wind pressure.

M. Bréguet has evolved the following formula for the lift of rotating blades of this description:—

$$q = P^{1.5} / WD,$$

where P is the weight lifted,

W is the power consumed,

D is the diameter of the rotor.

Taking into account the "solidity" of the rotor, i.e., the ratio of the actual supporting surface to the surface of the circle swept by the blades, the maximum theoretical value of q , when stationary and at ground level, is expressed, in metric units, by the very simple formula $q = 0.628 \rho v$, where ρ is the efficiency of the rotor considered as a ventilating helicoidal fan.

Thus, for example, if the efficiency attains the value $\rho = 0.7$, this maximum is 0.428.

High Efficiency

It should also be noted that, owing to the forward movement of the gyroplane, the blades of the rotors are continually reaching virgin zones of air, which greatly improves their efficiency, so that one may hope for a maximum value of q approaching unity.

With the above facts in mind, M. Bréguet makes a comparison between a monoplane and a gyroplane having the same maximum weight of 10,000 kg. (22,000 lb.) and both having a speed of 360 km/hr. (223 m.p.h.).

Taking a monoplane with a wing loading of 100 kg./sq. metre (20 lb./sq. ft.), an aspect ratio of 8, a wing surface of 100 sq. metres (1,076 sq. ft.) and a wing span of 29.3 m. (96 ft.), and allowing a 75 per cent. efficiency for

the airscrew, it is found that in order to obtain the speed of 360 km/hr., allowing for the usual commercial custom of utilising but 60 per cent. of the rated power of the engines, the monoplane would require:—

3,150 h.p. at an altitude of 2,000 m. (6,560 ft.).

2,500 h.p. at an altitude of 4,500 m. (14,750 ft.).

2,000 h.p. at an altitude of 7,000 m. (23,000 ft.).

The power furnished at these altitudes is respectively 1,880, 1,500, and 1,200 h.p.

On the other hand, M. Bréguet finds, according to a series of formulæ which he has prepared from tests he has made himself and also had checked at the Eiffel Laboratory, that a gyroplane would require rotating blades with spans 17.50 m. or of 19.65 m., according whether it is desired to fly at a speed of 360 km/hr. at altitudes of 2,000 m. or of 4,500 m. respectively.

A rotor span of 17.50 m. (57.4 ft.) would thus require

an actual blade surface of 14.3 sq. m. (154 sq. ft.), which, taking a "solidity" coefficient of 0.06, would correspond to a wing loading of 700 kg./sq. m. This calculation is based on the supposition that the maximum cross section of the parasitic drag surfaces of the gyroplane would be properly streamlined and not exceed 6 sq. m. in area.

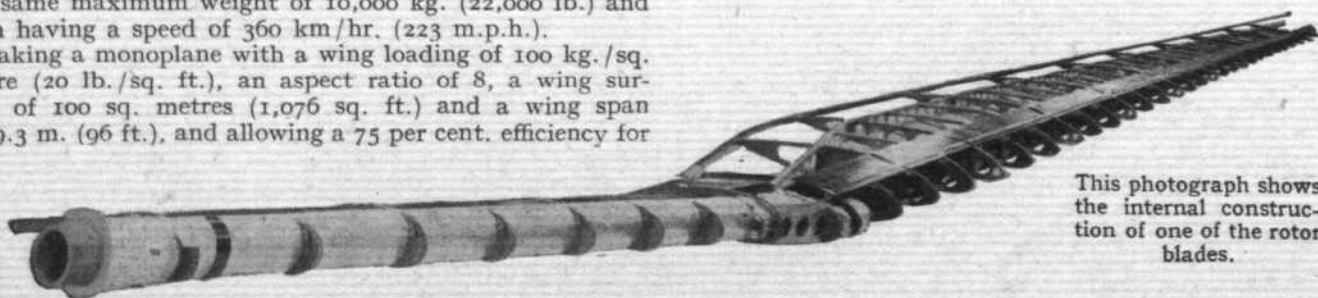
Under the foregoing conditions, the axis of the revolving wing surfaces—constituted in reality by two airscrews each with hinged blades, mounted one over the other and each turning in a contrary sense to the other—should be inclined at an angle of about 9 deg. from the vertical, in order to furnish the propulsive force.

The gyroplane thus equipped and flying at a speed of 360 km/hr. (223 m.p.h.) at an altitude of 2,000 m., would require 1,470 h.p., which would be equivalent to 60 per cent. of a rated power of 2,450 h.p. This would be but 78 per cent. of the propulsive power necessary for an aeroplane under similar conditions of speed and altitude.

M. Bréguet further calculates that the disposable load available in the foregoing monoplane and gyroplane respectively, at an altitude of 2,000 m. and flying at a speed of 360 km/hr., would be as follows:—

	Monoplane.	Gyroplane.
Useful load available	3,120 kg.	4,390 kg.
For a still-air range of 2,000 km. (1,240 miles) these loads could be apportioned as follows:—		
	Monoplane.	Gyroplane.
Fuel and oil	2,300 kg.	1,850 kg.
Fuel tanks	150 kg.	100 kg.
Available for payload	700 kg.	2,440 kg.

These figures show a ratio of about $3\frac{1}{2}$ to 1 in favour of the gyroplane.



This photograph shows the internal construction of one of the rotor blades.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS



AIR MINISTRY ANNOUNCEMENTS

FORMATION OF AIR OBSERVERS SCHOOL, NORTH COATES FITTIES

The Air Observers School will form at North Coates Fitties on January 1, 1936. The school will undertake the conduct of courses for:—(i) Air observers; (ii) Air gunners; (iii) Telegraphist air gunners. The school will be placed under the command of the A.O.C. Inland Area for administration and under the A.O.C. Armament Group for training.

No. 24 (COMMUNICATIONS) SQUADRON

The Marquis of Londonderry, former Secretary for Air, presented to No. 24 Squadron of the R.A.F., with which he has spent many hours flying, a silver water-gilt standing cup, heavily chased, with his arms on one side and the badge of the squadron on the other.

LONG SERVICE AND GOOD CONDUCT MEDAL

The Long Service and Good Conduct Medal has been awarded to the undermentioned airmen:—W.O.s Adams, E. J., Bett, L. A., Wilson, T.; W.O.s Heath, A. W., Pike, P. R., D.C.M.; Flt. Sgts. Arthur, H. E., Ashcroft, T., M.M., Banham, R. H., Bateman, F. J. R. H., Blake, E., Fidler, F., Manson, McD. B., Neal, G. R., Parker, S. A., Pearson, J. W., Ritchie, M., Shortland, S., Thompson, E. L., Webber, W. B., Williams, J. H. J., Sgts. Austin, F. E. J., Birnie, J. M., Carter, R., Cowley, H. J., Davis, J., Franklin, A., Grant, B. R., Hawkes, A. G., Johnson, E., Jones, B., Kemp, C. G., Kent, T., Maguire, G. W., Reaney, M. H., Stanford, F. C., Wood, L. G., West, A. E., West, S. L.; Cpl. Bannon, D.; Cpl./A./Sgt. Beaumont, J. S.; Cpls. Chase, J. J., Hobbs, F. W.; Cpl./A./Sgt. Lord, C. T.; Cpls. Mason, A. T., Pope, E. W., Pope, R. E., Scales, L. P., Symons, G.; L.A./C. House, W. H. L.; A/C.I. Stevens, A.

SPECIAL CHANUCAH SERVICE

A special naval, military and air force Chanukah service will be held at 1630 hours on December 22, at the Central Synagogue, Great Portland Street, W.1, and, so far as air force exigencies permit, opportunities will be afforded for officers and airmen of the Jewish faith at home stations to attend the service. Officers and airmen who wish to attend should communicate as soon as possible with Rabbi Dayan M. Gollop, B.A., Senior Jewish Chaplain to H.M. Forces, 13, Fawley Road, London, N.W.6.

PROMOTION EXAMINATIONS—OFFICERS

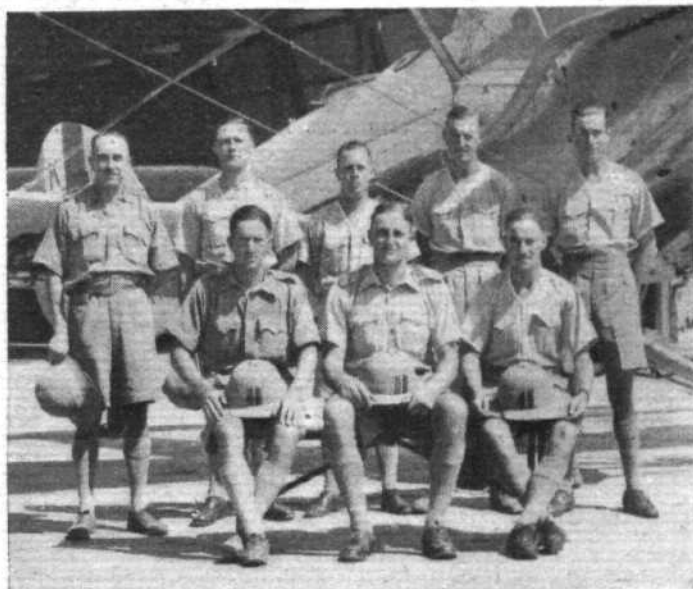
The undermentioned officers were successful in the promotion examinations held on September 10 to 13, 1935:—

PROMOTION EXAMINATION "B."

Flying Officers:—Altham, J. B., Bell, S. H., R.A.F.O., Bowman, A. McD., Burgess, L. W., Cameron, W. E., Christian, A. L., Collins, A. R., Craig, W. J., Dixon-Wright, F. W., Dwyer, M. H., Elwy-Jones, W. N., Emson, R. H. E., Faville, R., Fletcher, J. L. H., Geoghegan, A. W., Gibson, D. A., Glencross, A. R., Godden, S. F., Goodman, N. G., Grandy, J., Halliday, N. A. R., Halmshaw, W., Hamilton, M. B., Hare, M., Harvey, W. P., Heather, G. W., Jenkins, H. P., Johnson, D. V., Judge, J. W. B., Kelly, M. H., Kirkpatrick, H. J., Lang, T. F. U., Langston, S. P., Leacock, K., Ling, C. W. M., McIlwaine, A., MacKenzie, S. E., Marsack, A. H., Matheson, A. W. S., Mills, G. H. O., Montagu, G. W., Monypenny, J. B. S., Murray, W. F., R.A.F.O., Parselle, T. A. B., Pyke, A., Ramsbottom-Isherwood, H. N. G., Rutter, N. C. S., Ryan, R. S., Simmons, H. A., Skelton, G. F. A., Sloan, D., Sorel-Cameron, R., Spottiswoode, A. N., Springall, E. A., Stephens, J. F., Stewart, A. G. F., Stokes, F. E., Sutcliffe, W. P., Turner, W. H. N., Ward, Hon. E. F., Wild, F. W. L., Williams, C. W., Willis, J. O., Winn, R. I. B.

PROMOTION EXAMINATION "C."

Flight Lieutenants:—Adams, J. S. L., Bell, J. W., Cadell, C. S., Carvell, R. J., Coggle, C. K. J., Hutchinson, J. H., King, H. E., Macfadyen, D., Martin, L. G., Mutch, J. R., Ogilvie-Forbes, N. C., Rapley, C., Rowland, F. C., Thomas, J. E. G., Venmore, W. C., R.A.F.O., Wallis, J. B. M., Wheeler, H. G.



IN IRAQ: The team which won the Thomson Air Firing Cup.

COMBINED EXERCISES AT BOMBAY

Indian Army Headquarters have been conducting combined military, naval, and air force exercises at Bombay. Bombers have made sham raids on the city, warships have shelled it, and "enemy" troops have landed at Juhu, near the civil aerodrome.

R.A.F. BENEVOLENT FUND

The usual meeting of the Grants Committee was held at Iddesleigh House on Monday, December 9. Air Comdre. B. C. H. Drew, C.M.G., C.B.E., was in the chair, and the other members present were: Mrs. L. M. K. Pratt Barlow, O.B.E., Group Capt. C. H. K. Edmonds, D.S.O., O.B.E., and Air Vice-Marshal C. A. H. Longcroft, C.B., C.M.G., D.S.O., A.F.C. The Committee made grants to the amount of £365 17s. 9d. The next meeting was fixed for December 23.

ROYAL AIR FORCE FLYING ACCIDENT

The Air Ministry regrets to announce that A.P/O. Basil Linnington Evans is missing and is believed to have lost his life as the result of an aircraft accident on December 10, 1935, when the aircraft piloted by this officer fell into the River Humber near Brough. Salvage operations are being instituted. A.P/O. Evans, of No. 3 Flying Training School, Grantham, was the sole occupant of the aircraft.

EXTENSIONS OF SERVICE

The undermentioned officers have been selected for retention on the active list as indicated:—

General Duties Branch.

PERMANENT OFFICERS.

To be retained to age 50.

Wing Commanders—

Edward Garden Hopcraft, D.S.C., John Leacroft, M.C., John Whitaker Woodhouse, D.S.O., M.C.

To be retained to age 48.

Squadron Leaders—

Charles William Attwood, Henry Cockerell, O.B.E., Eric Blake Grenfell, A.F.C., Louis William Jarvis, Charles Reginald Keary, Philip Myles McSwiny.

Flight Lieutenants—

Robert Dawlas McEwan Hart, Augustus Alfred Jones.

To be retained to age 45.

Flight Lieutenants—

David Forgham Anderson, D.F.C., A.F.C., Thomas George Bird,

Walter Reginald Day, Eric Charles Delamain, M.C., John Douglas Stirling Denholm, John Augustine Elliott, Thomas Howell French, D.F.C., Basil Henry Godfrey, John Symonds Harrison, Francis Herbert Donald Henwood, D.F.C., Herbert Edward King, Anthony Leach, M.C., Pat Murgatroyd, Joseph Sylvester Nichol, Herbert George Rowe, D.F.C., Stanley James Smetham, Cecil Walker.

OFFICERS RETAINED IN THE SERVICE TO COMPLETE TIME FOR RETIRED PAY.

To be retained to age 55.

Flight Lieutenants—

William Gill, Arthur Henry Simmonds.

MEDIUM SERVICE OFFICERS—SERVICE TO BE EXTENDED TO COMPLETE 11 YEARS.

Flight Lieutenants—

Bertram Arnold James Crummy, Robert Frank Gandy, John Bruce Knapp, Henry Eustace Power, Alexander Edward Taylor, Frederick John Taylor.

SHORT SERVICE OFFICERS—SERVICE TO BE EXTENDED TO COMPLETE 7 YEARS.

Flight Lieutenants—

William John Brighty, Ronald George Edmund Catt, Hector Ivo Dabinett, Ralph Ian George MacDougall, William Arthur Richardson, Reginald Geoffrey Wilde.

Flying Officers—

Maynard Denis Crichton Biggie, George Burdick, Arnold Louis Christian, Ronald Neville Clarke, Montagu Victor Murray Clube, Eric Alfred Douglas-Jones, William John Howard Ekins, Walter Nigel Elwy-Jones, Dunstan Yves Feeny, Elliot Foster, Henry Lawrence Matthews Glover, William Marshall Hargreaves, Hill Hackness, Paul Ivor Harris, Horace James Leathem Hawkins, George William Heather, Peter Heylin Heygate, Anthony Delves Isemonger,

Maurice Henry Kelly, Edward Vincent Knowles, Kenneth Lea-Cox, Cedric Howard Mallinson, Francis Guy Mason, Alexander Moncrieff, Owen Aubrey Morris, Jeffrey Kindersley-Quill, William Arthur John Satchell, Henry Augustus Simmons, William Stephen Pomeroy Simonds, Jack Blanchard Sims, Walter John Smail, John Russell Watson, Hamish McCulloch White, Frederick William Lyder Wild.

SHORT SERVICE OFFICERS—SERVICE TO BE EXTENDED TO COMPLETE 6 YEARS.

Flying Officers—

Herbert Langdale Andrews, Ronald James Bennett, Frederick Arthur Agar Hawker Strath, Raymond Ivor Burgess Winn.

SHORT SERVICE OFFICER—SERVICE TO BE EXTENDED TO COMPLETE 5 YEARS.

F/O. Ronald Arthur Ramsay Rae.

Stores Branch.

To be retained to age 50.

Flt. Lt. William Bourne.

To be retained to age 48.

Flight Lieutenants—

Alexander Henry Allan, Hector Bell Smith Ballantyne, William Joseph Cleasby, Clifford Hanson-Abbott, Lewis Vere Hirst, Wallis St. John Littlewood, Fred Bail Ludlow, O.B.E., M.C., Alphonsus Michael Reidy, Osmond George Ridley, M.C., Josiah Edward Truss, M.C., Edmund Noel Digby Worsley.

Accountant Branch.

To be retained to age 48.

Flight Lieutenants—

Ernest Walter Horncastle, Alick James Moore.

ROYAL AIR FORCE GAZETTE

London Gazette, December 10, 1935

General Duties Branch

F/O. H. W. Marlow is granted a permanent commission in this rank (December 5). The notification in the *Gazette* of July 9 regarding Lt. H. L. Hayes, R.N., Flying Officer, R.A.F., is cancelled.

The following are reattached to the R.A.F. with effect from November 25:—Lt.-Cdr. A. A. Murray, R.N. (seniority as Flight Lieutenant, January 1, 1932); Lt.-Cdr. J. C. Richards, R.N. (seniority as Flight Lieutenant, July 1, 1933); Lt. H. L. Hayes, R.N. (seniority as Flying Officer, March 14, 1928).

F/O. W. C. Sheen is promoted to the rank of Flight Lieutenant (November 19).

The following Pilot Officers are promoted to the rank of Flying Officer:—G. A. Walker (seniority September 29, 1934), (March 29); H. J. Maguire, F. C. Scott (September 24); J. E. Townsend (October 3); J. A. K. Pettit (October 24); V. E. Maxwell (October 30); T. R. Vickers (November 16); J. J. McCarthy (December 3).

F/O. T. G. Lovell-Gregg takes rank and precedence as if his appointment as Flying Officer bore date October 13, 1933, immediately following F/O. A. W. Langton, on the gradation list (reduction takes effect from November 7); Group Capt. S. Smith, D.S.O., A.F.C., is placed on the retired list at his own request (November 21); Sqn. Ldr. V. Greenwood is placed on the retired list (December 6); Flt. Lt. F. G. Brockman, M.B.E., is placed on the retired list (December 1); Flt. Lt. C. Walter is transferred to the Reserve, Class A (December 1).

The following Flying Officers are transferred to the Reserve, Class A (December 5):—E. R. S. Johnston, M. Sorsbie, F. W. Yates.

F/O. J. R. Wemyss is transferred to the Reserve, Class C (December 5); F/O. (Hon. Flt. Lt.) D. C. J. Miller (Capt. 17/21 Lancers)

relinquishes his temporary commission on return to Army duty (Jan. 13). (Substituted for the notification in the *Gazette* of February 12.)

Stores Branch

F/O. T. King is granted a permanent commission in this rank with effect from December 3, 1934, on completion of probationary service.

Accountant Branch

Flt. Lt. A. J. Moore is promoted to the rank of Squadron Leader with effect from December 1, and takes precedence immediately following Sqn. Ldr. A. C. Lobley in the gradation list.

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

H. A. Crommelin (Capt. R.A.R.O.) is granted a commission as Flying Officer in Class C (November 23).

The following Flying Officers are transferred from Class A to Class C:—L. W. W. Modley (July 1); R. J. Bunning (November 18); F. D. Travers, D.F.C. (December 5); R. H. Lemon (December 7).

The following Flying Officers relinquish their commissions on completion of service and are permitted to retain their rank:—R. W. Cawston (August 4); H. V. Bullock (September 18).

SPECIAL RESERVE

General Duties Branch

P/O. M. A. Smith is promoted to the rank of Flying Officer (October 22).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Squadron Leaders.—J. A. McDonald, to No. 55 (B) Squadron, Hinaidi, Iraq; to command vice Sqn. Ldr. A. R. M. Rickards, O.B.E., A.F.C., 15.11.35. W. A. K. Dalzell, to R.A.F. Station, Singapore; for Administrative duties vice Flt. Lt. J. H. Hargroves, 16.10.35. J. H. Butler, to No. 39 (B) Squadron, Risalpur, India; to command vice Sqn. Ldr. S. D. Culley, D.S.O., 9.11.35. J. C. Foden, A.F.C., to No. 10 (B) Squadron, Boscombe Down; for Flying duties vice Sqn. Ldr. J. M. Glaisher, D.F.C., 6.12.35. C. S. Richardson, M.B.E., to Headquarters, R.A.F., India, New Delhi; for duty as Chief Signals Officer vice Sqn. Ldr. D. H. de Burgh, A.F.C.

Flight Lieutenant.—L. W. Cannon, to No. 60 (B) Squadron, Kohat, India, 8.11.35.

Flying Officers.—J. B. Ussher, to Anti-Aircraft Co-operation Flight, Biggin Hill, 4.12.35. G. Burdick, to R.A.F. Depot, Uxbridge, 5.12.35. N. E. Morrison, to No. 821 (F.S.R.) Squadron, 30.11.35. J. C. Northey, to No. 820 (F.S.R.) Squadron, 30.11.35.

Pilot Officers.—P. S. Gomez, to Headquarters, Fighting Area, Uxbridge, 3.12.35. A. R. D. MacDonell, to No. 800 (F.F.) Squadron, 1.12.35.

Medical Branch

Squadron Leaders.—J. D. Leahy, M.C., to R.A.F. Station, Calshot; for duty as Medical Officer, 1.12.35. W. J. G. Walker, to No. 7 Flying Training School, Peterborough; for duty as Medical Officer, 1.12.35. T. J. X. Canton, to R.A.F. Station, Manston; for duty as Medical Officer, 11.12.35.

Flight Lieutenant.—G. H. J. Williams, to Aeroplane and Armament Experimental Establishment, Martlesham Heath, 10.12.35.

Flying Officers.—J. P. D. Agate (Medical Quartermaster), to Headquarters, Inland Area, Stanmore; on appointment to a Permanent Commission, 4.12.35. P. A. Cooper, to No. 1 School of Technical Training (Apprentices), Halton, 1.12.35. T. J. M. Gregg, to Princess Mary's R.A.F. Hospital, Halton, 1.12.35. R. S. B. McClean, to R.A.F. Hospital, Cranwell, 1.12.35. R. L. Soper, to Princess Mary's R.A.F. Hospital, Halton, 1.12.35. L. N. Trethowan, to R.A.F. Station, Bircham Newton, 1.12.35. A. S. Amsden, to No. 7 Flying Training School, Peterborough, 1.12.35. H. E. Bellringer, to Home Aircraft Depot, Henlow, 1.12.35. C. M. Carlyle-Gall, to Central Flying School, Upavon, 1.12.35. R. A. Cumming, to No. 11 Flying Training School, Wittering, 1.12.35. W. J. L. Dean, to No. 2 Flying Training School, Digby, 1.12.35. S. R. C. Nelson, to No. 6 Flying Training School, Netheravon, 1.12.35. R. S. Peill, to No. 5 Flying Training School, Sealand, 1.12.35. J. B. Wallace, to R.A.F. Depot, Uxbridge, 1.12.35.

PLASTICS and AVIATION

Low Modulus of Elasticity the Main Problem : Interesting Applications Hindered by Cost of Presses and Moulds

WHAT are the possibilities of the wider application to aircraft construction of the materials generally known as plastics? This question was debated at a discussion arranged by the Institute of the Plastics Industry at British Industries House, London, last Thursday. Mr. C. Chapman, chairman of the London section of the Institute, was in the chair, and explained for the benefit of the audience that the synthetic phenol-formaldehyde resins came from carbolic acid and wood distillation respectively.

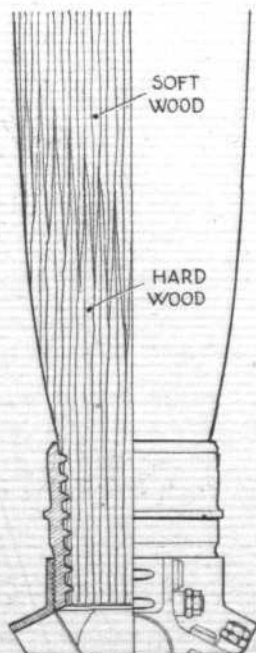
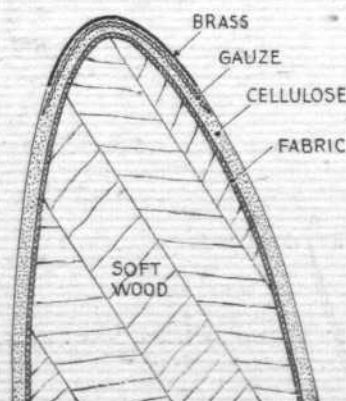
Capt C. C. Walker, of the De Havilland Aircraft Co., opened the discussion. He pointed out that plastics was a very large subject, and said it would be necessary for him to confine himself to possible uses of the material in aircraft construction. It seemed likely that these new materials might be found very useful for windows, owing to the very low weight and good optical properties.

Concerning the subject of airscrews, Capt. Walker pointed out that wood had been used for many years with satisfactory results, but had certain drawbacks. It was becoming necessary to use detachable airscrew blades, and with wood construction this presented some difficulty. With the increasing powers with which metal airscrews had to deal in modern times, the centrifugal stresses became very large, and it would be an advantage if a lighter substitute could be found. Of the various resinoid materials the laminated fabric type seemed to be the only practicable one at present. It was customary to have the layers of fabric running parallel. The De Havilland Co. were making a resin and fabric airscrew at the present time which had parallel fabric layers, although this was not ideal, and what was wanted was a non-parallel arrangement of the fabric layers to suit particular requirements. In the case of the new De Havilland propeller, he would not say that they were hoping for trouble, but they did expect it.

Micarta Propellers

Capt. Walker recalled that micarta propellers had been introduced by America during the war, and that they had been used with success on some of the hardest flights ever made. For instance, the late Sir Charles Kingsford-Smith had used them on the "Southern Cross" on his flight across the Pacific. The material appeared to have given very good results and Capt. Walker pointed out that a micarta propeller made for a 400 h.p. Liberty engine had been run for 25 hours while absorbing 1,000 h.p.

A variable-pitch airscrew with wooden blades. This diagram represents the Schwartz system, the British rights for which have been secured by The Airscrew Co., Ltd. The hub is compressed to increase its shear strength. Both it and the wooden blades are covered with cellulose acetate.



Turning to the subject of the now well-known Schwartz propeller, Capt. Walker said that this German designer seemed to have managed to make plastics serve his purpose in a very ingenious manner. He did not tie himself down to any one material but used compressed bakelite and wood for the hub and another plastic, cellulose acetate, for the blades.

Referring to the possibilities of using plastic materials for aircraft structural work, Capt. Walker said that a good material for aircraft structural work should have a high elastic modulus. Unfortunately the resins seemed to have a low modulus. He did not feel that this need necessarily be so, and thought that the material could be made suitable either by increasing in some way the elastic modulus, or by lowering the weight while keeping the elastic modulus the same. It seemed that the properties of plastic materials depended largely on the filler used. Fabric was better than paper, but was not necessarily the best that could be used. This was shown by bakelised



A wing rib made in synthetic resin. Mr. N. A. de Bruyne, of Aero Research, Ltd., has been obtaining promising results with a material of his own.

wood, the elastic modulus of which had been found to have been greatly increased. A limitation to the use of plastics as structural materials appeared to be the size of the hot presses necessary.

Pointing out that steel had about twenty times the elastic modulus of that of wood, Capt. Walker said that this did not condemn the material with the lower modulus, as both materials had been found useful in aircraft construction. It was a question of using each for the purpose for which it was best suited. He would like to see research carried out on fillers for these resins, and quoted some figures of research carried out in America some twelve years ago. By some form of impregnation, the modulus had been raised from 2 to 3.2. The strength in compression was, however, low.

Reverting to the subject of airscrews, Capt. Walker pointed out that according to the figures relating to its physical properties, the new Imperial Chemical Industries' resinous material "Perspex" could be used straight away for airscrews, but he did not think enough was known about the material yet, and would like to have further particulars.

Co-operation

Mr. H. V. Potter, managing director of Bakelite, Ltd., pointed out that he was in some difficulty owing to the fact that Capt. Walker had written a paper which he did not read, and that he (Mr. Potter) had got out some notes for a reply, so that he might be dealing with subjects which Capt. Walker should have dealt with, but had not. He pointed out that resinoid laminated propellers were used during the war, but for some reason were not proceeded with until recently. He pleaded for closer co-operation between the aeroplane people and plastics people. He had been very interested to hear of the Schwartz propeller, and it struck him that using a combination of materials in the one component was a very practical way of doing it.

Turning to the subject of moulded articles, Mr. Potter thought there must be many uses in aircraft. His impression was that the aircraft people had to have the very best of everything and that high quality was more important than cost. At present the quantities needed were small, but he thought that they would grow. It was necessary for the producer of resins to assume that this would be so, and not to expect mass production at first. With reference to the diffi-

culty of getting materials in sufficient lengths for aircraft structural use. Mr. Potter thought there were means of getting over this difficulty. Already components could be made in 20ft. lengths. He admitted that the low modulus of elasticity was inherent in the present plastic materials and that this was bound up with the filler used. Considerable amount of work remained to be done in order to improve this. Capt. Walker should have made reference to the need for a cold-jointing material but had not done so. When long lengths became available the need for such a material would not, perhaps, be so necessary. He thought it might be possible to join plastics in the same way that wood was joined. To show what could be done with laminated plastic materials, Mr. Potter said he had seen a canoe made completely of this material, and it seemed to be entirely satisfactory and was a very nice-looking job.

A Window Material

Dr. Caress, of Imperial Chemical Industries, said that undoubtedly resin M. ("Perspex") was the coming material for windows. Dr. Caress called attention to the damping in stress which resulted from the characteristics of plastic materials, and drew on the blackboard a series of hysteresis curves, explaining that these showed how the material did not at once return to its original state after being deflected under load.

Capt. Walker had referred to the figures of mechanical properties of "Perspex," and had said that according to them it should be possible straight away to make an airscrew of this material and to use it. Unfortunately this was not so. No filler was used in "Perspex," and the result was that the material was not tough enough for airscrews. He did not quite agree with Capt. Walker that much could be done to increase the modulus of elasticity by suitable choice of fillers. On the other hand, something could be done by altering the chemical composition of the resins themselves.

Dr. Caress then gave the number of figures of the mechanical properties of plastic mouldings and cast-iron. They were as follows:—

	Plastics.	Cast Iron.
Specific Gravity	1.4	7.5
Tensile Strength	3-5	14-18
Bending	4-6.5	18-27
Young's Modulus	400-600	3,000-9,000
Impact	2-3	10-19
Hardness	35-60	100-400
Compression	13-15	35-50

These figures showed that generally speaking the plastic material in moulded form was inferior to cast-iron, but if one divided all the figures by the specific gravity, it was found that the figures were almost identical for the two materials. He thought it could be said that plastics were in the same position now as cast-iron was when that was the only ferrous material. The introduction of laminations in plastics corresponded to the introduction of steel in ferrous materials.

Secondary Failure

Mr. G. Lyon, of the Fairey Aviation Company, pointed out that the fundamental bugbear of modern aircraft was instability or secondary failure of the thin sections of material used. For a given ratio of strength to specific gravity and elastic modulus to specific gravity there must be a material which gave the best results. Plastics with a specific gravity roughly one-half that of duralumin might be that material, but the low elastic constant put it right out of the class of steel, duralumin or spruce.

He complained that cases were not unknown of subsequent supplies of the material not producing the promised results. He was rather suspicious regarding the homogeneity of plastic materials; the impact value varied considerably and was much lower than for wood. He would like to know if the supply of raw materials was likely to be sufficient for all needs during the next few years.

Mr. W. D. Douglas, of the Royal Aircraft Establishment, Farnborough, pointed out that plastic materials had already found their use in aircraft work in the form of gear wheels for magneto drives and had given good results. In trying to form an opinion of the suitability or otherwise of plastic material in aircraft construction, it was necessary to differentiate between stressed and non-stressed parts. Plastic material could be used at once for non-stressed parts, but it was essential to be very careful indeed when it came to using them for stressed parts. Mr. Douglas pointed out that the tests of materials which aircraft engineers used had become very refined. The usual figures of mechanical properties used in general engineering were not sufficient for the aircraft engineer, and the figures for plastics were not yet available in the

form which the aircraft engineer wanted. He pointed out that in aircraft work they were not really interested in ultimate strength. For example, it was conceivable that some component of an aircraft wing could deform under load. This might set up air forces on the wing, which would result in the machine crashing, although the part which originally deformed might not be broken. What they were really interested in was the proof-stress which, he explained, was the point on the stress-strain curve at which the material departed from linearity.

Several speakers had made reference to airscrews made of plastic materials. At the R.A.E. they now had airscrews flying which were made of laminated materials. When the experiments were completed they should provide data relating to any changes that might have taken place during service. He agreed with other speakers that the modulus of elasticity of plastic materials was too low in plain forms, but that it could be increased by suitable choice of fillers.

Mr. H. W. F. Ireland, managing director of Moulded Products, Ltd., said the moulders were in a difficult position. They came between the supplier of the raw material and the supplier of the finished article. Reference had been made to the difficulty of making structural components for aircraft, but he would point out that fabric laminated mouldings had been made for such things as wing spars and had given good results. The material had also been used very successfully for such things as electric equipment, pulleys, fore-and-aft level indicators, and airscrews for driving electric generators. One great difficulty was that the cost of tools was prohibitive and might amount to £400 or £500. If the quantity required from the particular moulds was small, this high cost was a serious obstacle. They should try to get together and see if the cost of the tools could be shared in some way. He referred to the very close limits to which the aircraft people seemed to work, and expressed the opinion that these were not always necessary.

Temporary Moulds

It was, he said, perfectly feasible to produce fairly cheap temporary moulds that would do for small quantities, and if the aircraft designers would co-operate with the moulders something could undoubtedly be done. The cheap temporary moulds would do for small quantities sufficient to show whether the particular article was satisfactory, provided too fine limits were not insisted upon. Afterwards if it was intended to produce the article in greater quantities, more perfect and more durable moulds could be produced.

Reference had been made to the use of resin M. for windows. It seemed to him that there were many other uses one could think of, such as inspection covers, which would enable the engineer to inspect what was underneath the cover without having to remove it. He also thought that resin M. might be used for instrument covers instead of glass. The material was a good deal lighter than glass and did not splinter and shatter under vibration in the way glass did.

Dr. H. C. Watts, of the Aircrow Co., said that he was extremely interested in plastic materials, recalling that he had been the first to bring micarta propellers into this country in 1918. Very recently he had been responsible for introducing the Schwartz, which promised to do very well, and was already standard for propellers of aircraft in the R.A.F. He pointed out that a 24ft. diameter propeller covered with cellulose acetate on the Schwartz principle had been working for a very long period at Imperial Chemical Industries in an atmosphere corresponding to perpetual rain, and, as far as he knew, was giving complete satisfaction.

By way of showing what could be done to increase strength Dr. Watts pointed out that in the Schwartz type of variable pitch airscrew, the root was very highly compressed, and this had resulted in the shear strength being increased about three times. Propellers of this type were now being tested in this country, and he personally had no doubt that they would give completely satisfactory results.

Mr. G. Cornwall, chief designer of the Heston Aircraft Co., said that in estimating the possibility of using plastics in the future in aircraft construction, it was necessary to bear in mind what the future type of aircraft construction would probably be. He thought it would be agreed that this was likely to be of the stressed skin type. Modern aircraft demanded a smooth finish without projecting rivets or other causes of roughness. He thought plastics could be used in two ways. Perhaps some day it might be found possible to press fuselages and wings out of two sections. In the meantime, it would seem that there was a possibility of using plastic materials like they now used metal skins. If one thought of plastic materials in terms of thin sheet, the qualities

were reasonably good with the exception of Young's modulus, and, owing to the low specific gravity, it should be possible to use the plastics in heavier gauges which would help to give the panels stability against secondary failure or buckling.

The question of the mechanical technique necessary would have to be gone into. Jointing would have to be of a form which left the surfaces smooth, as laps and rivets that projected were not wanted. He thought perhaps the answer might be a good cement. He knew of one comparable in its properties with good glue, but it did not seem to him that this was really sufficient for the purpose, and that the material to be used should have greater strength.

Mr. H. V. Potter and Major J. S. Buchanan were asked to sum up for the plastics industry and aircraft industry respectively. Mr. Potter caused great amusement by his humorous reference to the hysteresis curves of Dr. Caress. He said all that stuff was bunkum and they all knew it was, but it happened to fit in with their theories! The figures given by Dr. Caress related to average moulded materials, and actually there were in existence high-tensile materials in plastics.

Mr. Douglas had asked for certain figures of mechanical properties, not customarily used in ordinary engineering, and this had called attention to the necessity for the two industries to get together. The question might be asked whether the supply of plastic materials in the future could be guaranteed. Mr. Potter said that in view of the ample supplies of coal and tar there was no reason to doubt that the raw materials were available in ample quantities for any needs likely to arise. Mr. Ireland's remarks concerning the question of expensive tools again emphasised the need for close co-operation between the two industries. It seemed, according to the discussion, that the plastics people did not really know what they could do, and the aircraft people did not know what they wanted.

In conclusion, he said he felt very sorry for Mr. Young, whose ears must be burning that evening after all the talk there had been about his modulus.

The Industry's Requirements

Major Buchanan, Deputy-Director of Technical Development at the Air Ministry, said the industry had very definite views on its requirements, contrary to what Mr. Potter had said. The mechanical properties of aircraft structure materials were extremely important, and they could not afford to take chances. It was admitted that plastics had been used for propellers, but the material seemed rather to fall down on its low creep stress. The curves shown by Dr. Caress seemed to indicate that the plastic material was in perpetual motion, and he was by no means certain that was a good thing.

Capt. Walker had referred to the question of stretch and had said that provided this took place in a symmetrical way it would probably not affect the propeller performance very much. He was by no means certain that one could expect all the molecules to march in the same direction at the same time in the way desired, and unless they did he felt that serious distortion might arise.

The discussion had brought out the fact that tools were a fundamental difficulty. The aircraft industry had not yet settled down to the point where it was ordering 50,000 off one model. It was more likely to be 500 or even 50. With reference to mechanical properties, the aircraft people wanted high fatigue values and high Izod values.

Reference had been made to the use of "Perspex" as a window material. While at present it certainly seemed to have its use in that direction, he would point out that the

aircraft people not only wanted windows they could see through, but windows they could go on seeing through. By that he meant that it was essential that the material should not deteriorate or discolour after prolonged exposure, and would have to be capable of standing up to climatic conditions in the tropics as well as at home.

One thing he noted had not been mentioned in connection with the use of plastics, and that was its application to the jointing of plywood. He regretted to say that at the present time the material so used came from Germany. The bakelite-jointed plywood had proved a very excellent material, not only in its mechanical properties but in its weather-resisting qualities.

In conclusion, he said that the aircraft industry appreciated the possibilities of plastic materials and looked for great things from them in the future.

Phenol-Formaldehyde Synthetic Resin Products—Laminated Materials—Fabric Sheets.

Physical Characteristics.

Specific Gravity, 1.33—1.37	...	...	F = 12—30
*Impact Strength (cm. hgms./sq. cm.)	...	...	F = 20—50
Tensile Strength (lb./sq. in.)	...	...	8,000—12,000
Shearing Strength (lb./sq. in.)	...	...	10,000—15,000
*Crushing Strength (lb./sq. in.)	...	...	E. 20,000—30,000 F. 24,000—50,000
Water absorption	...	...	0.5%—2%
Brinell Hardness	...	...	35—55
Young's Modulus (lb./sq. in.)	...	...	0.5—1 × 10 ⁶

*Edgewise and flatwise figures are given for the laminated fabric materials under impact strength and crushing strength, i.e., first line edgewise, second line flatwise.

The above type of laminated material is manufactured in Great Britain and sold under the following trade names: "Trefoil" Bakelite; Fabrol; Formapex; Paxolin; Traffolite; Tufol; Bushing.

Sizes of sheets available up to 8ft. × 4ft. × 4in. thickness.

Sizes of tubes available up to 8ft. long × 3ft. diameter.

Resin M Cast Form.

Density, 1.19. Water absorption, 1.35 per cent.

Mechanical Properties:—

U.T.S.—15,000.

fc. = 31,000—34,000 = compressive strength.

fs. = 9,000—10,000 = shear strength.

Impact strength [Kg./cm. (Izod—Avery)] 3.5—5.0.

E = 0.45 × 10⁶.

Elastic limit in compression: 40° C., 24,500; 0° C., 12,300; 20° C., 10,700; 40° C., 4,700.

Optical Properties: Reflective index, 1.503; Relative dispersion, 57.3; Resin M is more transparent than glass near infra-red, but completely opaque to infra-red in the region 2a.

Resistance to chemical attack: Unaffected by aviation spirit and lubricating oils; by cold hydrochloric and nitric acids of all strengths; by sulphuric acid up to 60 per cent. concentration; and by alkaline solutions.

Thermal Properties:—

Thermal Conductivity (c.g.s. units) 6 × 10⁻⁴.

Coefficient of Thermal Expansion:

Mean value between—39° C. and 15° C., 51 × 10⁻⁶ C².

Mean value between—20° C. and 60° C., 69.3 × 10⁻⁶ C².

This type of cast resin is manufactured in Great Britain and is sold under the trade name "Perspex."

Strengths of sheets of various materials under compressive end load as determined from the formula

$$p = k \frac{E}{1 - \sigma^2} \left(\frac{t}{b} \right)^2$$

All sheets of the same breadth *b*, the thickness *t* being chosen to give constant weight

Material.	E	Ratio of collapsing load.
Three-ply	1.5 × 10 ⁶	150
M.g. alloy	6.05 × 10 ⁶	22
A.F. alloy	10.5 × 10 ⁶	8
Phenol-Formaldehyde Synthetic Resin	.75 × 10 ⁶	5
Steel	.30 × 10 ⁶	1

Forthcoming Events

Club Secretaries and others are invited to send particulars of important fixtures for inclusion in the list.

Dec. 19. R.Ae.S. (Coventry Section) Lecture: "The Stratosphere," by Capt. J. Lawrence Pritchard, 8 p.m. Armstrong Siddeley Canteen.

Dec. 20. London Aeroplane Club. Annual Ball, Park Lane Hotel, London.

Dec. 21. Brooklands Aviation Ltd., Annual Dinner.

1936.

Jan. 14. Irish Aero Club. Annual Dance, Gresham Hotel, Dublin.

Jan. 16. R.Ae.S. (Coventry Section) Lecture: "Development in Centrifugally Cast Piston Rings for Modern Aero Engines," by Mr. P. R. Twigger, 8 p.m., Armstrong Siddeley Canteen.

Jan. 22. Royal United Service Institution Lecture: "The Expansion of the Royal Air Force," by Air Marshal Sir C. L. N. Newall, at 3 p.m.

Jan. 22. Civil Aviation Service Corps, No. 1 (London) Sqn. Dance, the Horns, Kennington, 8.30 p.m.

Jan. 30 and 31. Aerodrome Owners' Association: Annual Conference and Aerodrome Equipment Exhibition, British Industries House, Marble Arch, London.

Feb. 12. Yorkshire Aviation Services Country Club. Dinner and Dance, 8 p.m., Grand Hotel, Harrogate.

Feb. 20. R.Ae.S. (Coventry Section) Lecture: "Variable-pitch Propellers," by Mr. T. E. Beacham, 8 p.m. Armstrong Siddeley Canteen.

Feb. 28. Bristol and Wessex Aeroplane Club: Annual Aviation Ball.

Mar. 10. Royal United Service Institution Lecture: "The Development of Civil Aviation," by Lt. Col. F. C. Sheldermine, at 3 p.m.

Mar. 19. R.Ae.S. (Coventry Section) Lecture: "Type-Testing an Aircraft," by Flt. Lt. Bulman, 8 p.m., Armstrong Siddeley Canteen.

April 16. R.Ae.S. (Coventry Section) Lecture: "Aircraft Instruments," by Mr. J. E. Chorlton, 8 p.m., Armstrong Siddeley Canteen.

May 15. June 1. Stockholm Aero Show.

June 6. Annual Display, R.A.F. Flying Club.

June 20. Brooklands "At Home," Brooklands Flying Club.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for publication in these columns.

ICING: CANADIAN EXPERIENCES

[3094] I read with keen interest in *Flight* of November 14 your report on the paper read by Mr. Lockspeiser before the R.Ae.S.

Recently I returned from Canada, where I spent eight years flying in all kinds of weather and in temperatures ranging from 100 deg. F. in the shade in summer to -12 deg. F. in the winter (*i.e.*, ground temperatures).

Ice formation on aircraft in the autumn is one of the many hazards that Canadian pilots have to contend with, and I found by experience that ice begins to form on the bottom of the leading edge and builds up very irregularly until the edge is completely covered.

I found that a layer of thick oil on the leading edge, thicker underneath than on the front and top, was quite an effective preventer of ice formation during flight. When 'planes were left in the open exposed to the elements, ice would form over the whole surface of the wing, but it would quickly break off as soon as the 'plane got under way, due to the fact that the film of oil prevented the adhesion of ice to the leading edge.

Particular care should be taken to eliminate ice formation on aircraft with slotted wings. If during flight the aircraft becomes wing-low, it will be found that ice has been formed between the slot and the wing, preventing the slot from seating properly. A landing should be made as soon as is possible if the ice does not break off, because the wing-lowness becomes worse as the ice builds up. Always check the slots before taking off to ensure they are not frozen in their sockets, or otherwise a serious accident may result if only one slot is working.

There are so many other problems concerning ice formation which require investigation, especially in view of the reported services to Canada to be operated by the Imperial Airways. These problems are:—

- (1) Ice formation on sea aircraft.
- (2) Carburetters freezing on sea aircraft.
- (3) Ice forming on windscreens and cabin windows of sea aircraft.
- (4) Ice forming on pitot tubes.
- (5) Ice forming on controls of sea aircraft.

Metal crystallisation is another matter which requires investigation. I am convinced that a number of crashes are caused by fracturing of metal parts of aircraft, due to the action of extremely low temperatures on the metals.

I am of the opinion that the metal crystallises, especially in those parts of aircraft which are subject to an increase in temperature, such as engine bearers (heated by the engine) and struts (which are slightly heated by friction near the pivot ends, or by changes in temperature such as metal parts would be subjected to on 'planes which fly daily at high altitudes).

Sunninghill, Berks.

G. R. HICKS,
(Flight Lieutenant).

OUT OF THE PAST

[3095] I recently discovered in a scrap dealer's yard an early type of aeroplane engine which, considering the date of manufacture (probably about 1911), embodies some interesting and unusual features.

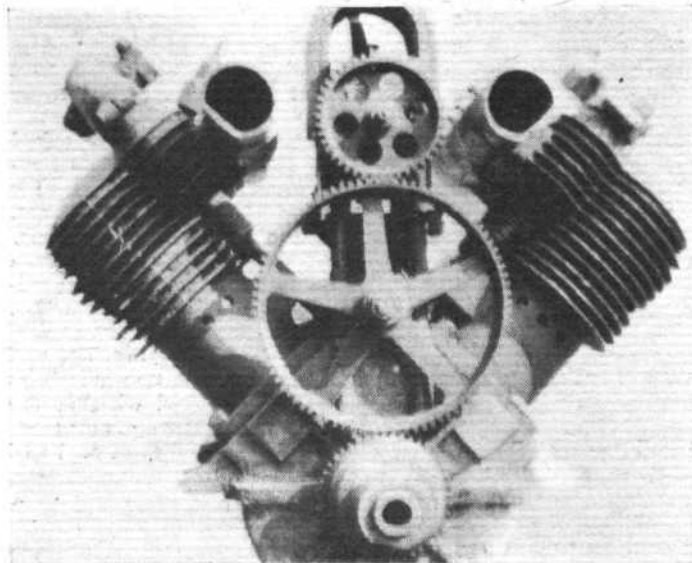
It is an air-cooled 90-degree four-cylinder J.A.P. of approximately 26 h.p. at the R.A.C. rating, the bore and stroke being 86 by 115 mm.

Each cylinder, of 688 c.c. capacity, is fitted with four valves, two automatic overhead inlet and two exhausts operated from a common open camshaft *via* long non-adjustable tappet rods. The cast-iron pistons each carry three stepped rings, while the solid gudgeon pins, of only 13 mm. diameter, are secured by set pins—then a common practice.

The big-end bearings are rather unusual for the period in that they consist of generously proportioned ball races of somewhat unique construction. First the split inner race is secured by set pins to the journal and the outer race, complete with connecting rod, is then threaded over it, the balls afterwards being forced in *via* a small relieved portion of the outer race.

Three plain split bronze bearings carry the two-throw crankshaft. The journals are hollow and are plugged with cork to prevent oil leakage, while a screw-down Stauffer-type greaser on the front main bearing is the only auxiliary lubrication to splash feed.

Unfortunately, the carburetter and induction pipes were missing, the make and type of the former are not known.



Mr. L. Gwynn's snapshot of the early J.A.P. vee-four aero engine, referred to in his letter below.

The power-weight ratio, of necessity calculated without this knowledge, nevertheless compares interestingly with modern ratios. The 26h.p. engine (less carburetter, etc.) weighed 130 lb.—5lb./h.p. in contrast to the 0.98 or so lb./h.p. of to-day.

A somewhat "extravagant" unit from this point of view is the massive Bosch magneto, mounted high between the cylinder banks and weighing nearly 20lb. One wonders how it functioned during a rainstorm; the h.t. brush is exposed to view.

As to fire risk: in addition to the very short exhaust manifolds, six holes were drilled in the bottom of each cylinder wall to expedite the burnt gas outflow—a popular theory in the early days of I.C. engines, which must have resulted in spurts of flame in all directions.

It would be very interesting to hear from readers who have had some experience (particularly flying) with this type of engine and also to ascertain the exact year of manufacture.

This list of the principal measurements and weights may interest the student of aeroplane engine design:

Ninety degree vee 4 cylinder of approx. 26 h.p. Total weight less carburetter and induction pipes, 130 lb. Bore and stroke, 86 × 115 mm. (688 c.c. per cylinder). Crankshaft journals 1½ in. diam., front bearing 3½ in. long, rear and centre 2 in. long.

Aluminium crankcase weighs 15½ lb. Airscrew boss, 4 in. diam., 8½ in. holes for securing airscrew.

Valves: 4 per cylinder, all 1½ in. diam. Exhaust valve stems, ½ in. diam. Exhaust valve springs, ½ in. diam × 2½ in. long.

Cast-iron pistons each carry three rings ¾ in. wide; weight with gudgeon pin 2 lb. Connecting rods are of H section and the big end ball races are 2½ in. O.D. and 1½ in. I.D. Cylinders, with valves and plugs, weigh 5 lb. each. Magneto. Open-type Bosch type H.D.2. Weight with pinion, 19½ lb.

Whitchurch, Shropshire.

L. GWYNN.

[There was also a larger J.A.P. engine produced in 1911. This was of the vee-eight type, and developed 40h.p. at 1,800 r.p.m.—Ed.]

THE AUTOGIRO AND SAFETY

[3096] In the British Aircraft Industry number of *Flight* your correspondent Mr. Priest states that "the Autogiro is about the least efficient of all planes." One understands, naturally, that efficiency makes for safety. Therefore, according to Mr. Priest, this type of aircraft must be deemed unsafe.

My knowledge of aeronautics is slight, but I have always admired the principle of the Autogiro and, although there are comparatively few of these machines in use, there appears to be comparatively few accidents with them. In your review of machines produced by A. V. Roe and Co. one reads a description which is definitely contradictory to Mr. Priest's statement. For instance, "the machine can be brought down without forward run after touching. As the rotor blades continue to rotate when the machine is descending, stalling cannot occur." Surely that makes for safety and efficiency?

I should appreciate the views of someone with experience of both types of aircraft.

H. HOLMES.

Chesterfield.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —



NIGHT MAIL : The scene on Croydon's tarmac a few minutes before ten o'clock. The D.L.H. freighter, a Ju. 52, is just about to leave on its nightly journey to Berlin. This service is run, winter and summer, with almost monotonous regularity.

THE WEEK AT CROYDON

Winter Long-distance Passengers : Christmas Mail Records : The Dawn Dash : A Visit with Potentialities : Cards and a King

IMMIGRATION officials at Croydon are astonished at the marked increase of long-distance passengers this winter. In the earlier years of connections to places such as Marseilles, Malmö or Vienna the summer passenger fought shy of travel further than Paris or Amsterdam in winter, but the reliability now shown on these longer lines has changed all that. Imperials, Air France, and D.L.H. all report this increase in long-distance passengers, and K.L.H. last Saturday and Sunday had full loads on the 8.20 a.m. departure, without a single local passenger to Amsterdam or Rotterdam. All, on both days, were for Prague, Hamburg, Copenhagen, Malmö or Berlin.

Capt. "Jimmy" Youell, of Imperial Airways, left Croydon last week with G-ABKY, the Vickers Velox, for Karachi with Christmas mail. The machine was entirely filled, all passenger fittings being removed. His first officer was Mr. Woodhouse, and the trip is to be one of four days out and four days back, so that these officers will be home again for Christmas. Capt. O. P. Jones also left with a special Christmas mail, in a Diana class aeroplane, for Rome. I am told that mail along the route to Australia reached the total of 2½ tons last week. The last South African air mail left Croydon on Saturday, December 14, and was estimated at 2½ tons, or about 300,000 letters.

There is apparently keen but friendly rivalry between firms operating the early morning Paris run out and home. Two pilots made a spectacular race the other day in to Croydon and one or other got in first by the skin of his teeth. Much as we all like a bit of sport, everybody at Croydon believes that this purely commercial airport is

not the place for it. Many years ago French and English or German and Dutch pilots used to race home to Croydon, but by common consent the old-established firms gave it up.

What may be an epoch-making flight, to use a hackneyed and much-abused term, was started last Friday, December 13, when Capt. Morton, chief pilot of British Continental Airways, Ltd., accompanied by the company's senior wireless officer, Mr. Hamblin, left Croydon with a D.H.86 machine, on board which was Sir Percy Graham Mackinnon, chairman of the company's board of directors. The object of the flight is to visit Amsterdam, Berlin, Hamburg, Copenhagen, and Malmö, from which city train will be taken to Stockholm, headquarters of the Swedish firm, A. B. Aerotransport. In these cities negotiations are to be carried on with the heads of the air traffic companies with a view, I understand, to opening up the first British service to Scandinavia *via* Holland and Germany. It is strange that this by no means unfruitful route has never yet been operated by a British company.

Return of the Captive

Large numbers of Press and photographic people assembled at Croydon last week to see Capt. Kane return from imprisonment in Spain. All sorts of wily precautions were taken by those who had him under their wing. I understand that a ticket was even bought for him, under his own name, for an Imperial Airways service, whereas eventually the gallant captain arrived at Abridge, Essex.

A strange though true story is being told here at Croydon regarding a passenger who travelled by a later service

Commercial Aviation

from Brussels on the day of the tragic accident to the Sabena machine. He travelled by Imperial Airways, and on arrival lodged a bitter complaint that although booked by the earlier Sabena machine he had not been able to travel owing to some clerical error or misunderstanding, and had consequently been turned off the Belgian machine. At the time of the complaint he was unaware that the machine in question was a tangled mass of wreckage on Tatsfield Hill.

Last week I was told that a noted big-game hunter was leaving by Imperial Airways for Africa. Somehow it seemed all wrong that he should be beautifully dressed, as for Bond Street, and carrying a neatly rolled umbrella. Flying brings such places so near that one almost expects people to set out in the appropriate kit, gun in hand, just as a man leaves home by car in shooting kit if he is motoring to a shoot.

Prohibition

I see from the newspapers that American air companies have banned cocktail serving in their air liners. They say they are glad the majority of their passengers voted against cocktails, as it relieves their employees from the dangerous and invidious task of deciding how many drinks a passenger may safely consume. Over here we should never assume in advance that first-class passengers were liable to drink too much in the air, nor should we expect that the steward, backed by the authority of the commander, might not be sufficient to deal with the problem of the occasional super merry and bright traveller. Employees of air lines have naturally got to take the normal responsibilities which come their way.

A Phoenix for Australia

MR. C. J. MELROSE has ordered a Phoenix from the Heston Aircraft Company, and this will probably be shipped out to Melbourne at about the end of January. It is understood that Mr. Melrose will use this machine in a new commercial flying concern which he is starting in Australia.

Refinement in Blind Flying

MR. BRIAN DAVY, who for several years has specialised in teaching Heston pupils to fly by instruments, is now introducing them to a new aspect of blind flying. The pupil, under the hood, is taught the method of approaching an airport in bad visibility on a series of wireless bearings and instructions from the control tower.

The instructor, seated in the front cockpit, himself fulfils the functions of control officer, while the pupil must learn to interpret his directions, and, without outside visual aid, bring the machine by instruments down to within a few feet of the ground.

The international "Q" code is used, and the pupil is familiarised with its workings while actually in control of an aeroplane. The system could, of course, be extended by the fitting of wireless transmitting and receiving apparatus in the training machine, but this would throw an unnecessary burden on the control officer (even in the unlikely case of its being permitted at any controlled airport) and, in practice, the instructor in the front cockpit is in an equally good, or better, position for directing the hooded pupil.

It is hoped that such instruction will be useful, in particular, to transport pilots who have no previous experience of approaching an airport on wireless instructions.

The Tatsfield Accident

PENDING the results of official investigation it may appear premature to voice an opinion concerning the tragic accident to the Sabena machine at Tatsfield.

At Croydon, however, there is an international brotherhood of air pilots and these, whilst deeply sympathising with their Belgian comrades and with Sabena, cannot be expected to refrain from discussion. Pilots' gossip is often very illuminating, for they know what they are talking about.

There is little doubt, writes a Croydon correspondent, that ice formation had something to do with the loss of the Savoia-Marchetti, though this is not quite the bugbear it is made out to be simply because a pilot is usually made aware of its formation early enough to take measures. In this case it is evident that ice-forming conditions existed, because the wavelength of the machine's transmitter was fluctuating shortly

On the K.L.M. Sunday service inward from Holland came Mr. and Mrs. Richbacher. Mr. Richbacher is a Pan American Airways' pilot, possibly over here to study our antiquated customs. It was *not* this American pilot who last summer remarked that he noted we did not yet fit de-icers to our machines and guessed we fitted them to our beer-engines instead.

Capt. Percy, of Imperial Airways, is back from the East. He and Capt. Tweedie, by the way, are the only two Imperial two-and-a-half ringers, or junior captains, who fly the big machines. It was Capt. Tweedie who once flew the late King Feisal of Iraq incognito from Basra to Bagdad. Two Americans on board the machine suggested bridge, and the king and his aide-de-camp agreed. At Bagdad there was a guard of honour, reception committee, and all the flags were flying. The Americans enquired who was the guy all the fuss was about, and when informed that it was King Feisal one of them remarked: "Say, if anybody had told me I'd lose fifty dollars at a game I thought I knew to a reigning monarch up in the air over the Garden of Eden I'd have called him a liar. Yes, Sir!"

Surrey Flying Services, Ltd., report an ambulance case from London to Paris in their *Dragon Blue Mist* piloted by Capt. Hancock, who made the journey in 1 hr. 55 min. Mr. Carnegie, chairman of the British Corporation of Cawnpore, flew from London to Allahabad by K.L.M., and Fraulein Leni Riefenstahl flew to Berlin. She will be remembered as having acted in "The White Hell of Pitz Palu" and "The Blue Light," both recently shown in London. Nat Gonella and his band will fly from Rotterdam to London by K.L.M. shortly. A. VIATOR.

before the accident, and this usually indicates the presence of ice on the trailing aerial.

Perhaps the pilot, becoming aware of this, descended to a lower level with a view to finding out his exact position, meaning, if conditions grew worse, to land at some aerodrome in his immediate vicinity. If, in searching for his position, he throttled back his engines, ice may have formed so that, when he opened up again, they would not "take it." Originally he may have throttled back because of ice on the airscrews, and it is also possible that his instruments, or some of them, may have been put out of action. There is also, of course, the somewhat remote possibility that ice affected the controls.

Somehow or other, it appears, ice formation played its part in the accident, and the consensus of opinion appears to be that, in all probability, inability to give the engines full throttle at a critical moment precipitated a stall.

Whatever may have been the cause of the accident, opinion among the pilots of five nations is unanimous on the two points: That it was in no way the fault of that fine and experienced pilot M. Schoonbroodt, and that there was no lack of skill and care in the maintenance of the machine. Much of the Belgian company's immunity in the past has been due to careful maintenance of the fleet and careful flying by an exceptionally fine body of pilots under the supervision of M. Cocquyt, the Sabena chief pilot. [In a leading article appearing in this issue one or two other possibilities are examined.—ED.]

W/T for Charter

BIRKETT Air Service are fitting W/T transmitting and receiving apparatus to their Merlin, newly returned from Abyssinia. Many air taxis use radio telephony, but this has the disadvantage of restricted range, and there is also the language difficulty abroad. The use of telegraphy, which requires a radio operator in addition to the pilot, should increase the scope of Birkett Air Service and their ability to fly in all weathers.

A Flying Laboratory

WITH the increase of real blind flying and all that it implies, it is particularly interesting to record the fact that Smith's Aircraft Instruments, of Cricklewood, who are now handling all the Standard aeronautical radio products, have ordered a D.H. Dragon which will be flown, of course, by Mr. H. M. Samuelson. This machine will be fitted with a range of Smith's instruments, including a radio compass, an automatic pilot, a Holmes tele-compass, and Lorenz blind-landing equipment. A flying laboratory, in fact.

Charting Ice Floes

A SOVIET pilot, Molokov, has recently returned from an Arctic flight of 19,000 miles made to study the ice conditions in the eastern section of the Northern Sea Route.

Blind Flying Training

AFTER March 31, 1936, it will no longer be possible for prospective or actual "B" licence pilots to take the tests for blind flying endorsement at one of the approved schools. It will be necessary for each pilot to pass an official Air Ministry test. The existing scheme was started because the number of pilots requiring such training and tests was too large to be handled at the official centres.

Swissair Traffic

DURING 1935, 21,927 paying passengers were carried by Swissair as compared with 16,148 carried during the previous year. This company now owns five Douglas D.C.2s, two Clark G.A.43s, and two Lockheed Orions. No accident involving loss or damage has been recorded during the past year.

The winter service between London and Switzerland, which started on December 16, leaves Croydon at 9.10 a.m. and leaves Zurich at 1.35 p.m.

New Directors for B.C.A.

TWO new directors have been appointed to the Board of British Continental Airways, the company which is operating air lines to Amsterdam via Antwerp and to Brussels and Lille.

One of these is Sir Robert Burton Chadwick, who was secretary to the Board of Trade in the last Conservative Government, and the other is Mr. Graham Mackinnon, an aviation underwriter in Lloyd's, who is well known as a private owner. Mr. Mackinnon is a son of Sir Percy Mackinnon, Chairman of the Board of Directors of British Continental Airways.

Transatlantic Plans

ON December 12 the conference on Atlantic air services was concluded at Washington, and Mr. Walton Moore, the chairman, explained that experimental flights would begin in the early summer of next year, and that, when a regular service is inaugurated, there would be four round trips every week. The mail contract question was necessarily postponed for further consideration.

The agreements permit the landing of Pan American Airways' machines in Bermuda and in this country, and, of course, of Imperial Airway's machines in America. The two routes will be, as already recorded, from St. John's, Newfoundland, to Cobh, in the Irish Free State, with a second and longer one using the Azores and Bermuda. Pan American Airways announce that they will use the Martin and Sikorsky boats.

The London-Lisbon Service

MR. LEO CRILLY arrived in Lisbon on December 5 in order to complete the negotiations for the establishment of the London-Lisbon air line. He carried a personal letter from Mr. Stanley Baldwin to Dr. Oliveira Salazar, the Portuguese Prime Minister.

Three trial flights will be made, the first machine leaving Lisbon on December 22, and these will give the pilots a chance to get to know the route. British commercial concerns, as well as the banks in Lisbon, welcome the service. The freight will be composed of certain fish, fruit and cut flowers, and Mr. Crilly has made arrangements with various London catering firms for the conveyance of Portuguese delicacies, including the famous red mullet for which Setubal is justifiably renowned.

Until the new airport of Lisbon is ready, which is expected to be in about two months time, Cintra aerodrome will be used. Thus the visitor alighting at Cintra will be taken to Lisbon by the very good road via the Estoril and the north bank of the Tagus, creating a very pleasant impression to the stranger arriving in Portugal for the first time. A Lisbon-Oporto service is contemplated in due course, the only difficulty being the lack of a suitable aerodrome near the northern capital.

Mr. Crilly is to be congratulated in getting things done, but it has meant much hard work and literally sitting on the doorstep of the National Air Council for months.

Southampton's New Equipment

ON Friday of last week the new night landing system at Southampton Airport was officially demonstrated. The installation of this equipment was divided between the firms of Chance Bros., who were responsible for the floodlighting, the wind Tee and general obstruction lighting, while the General Electric Company laid out the boundary lights.

During the demonstrations an Airspeed Envoy, piloted by Flt. Lt. Colman, made landings both while using the new equipment and with the aid of its own landing lights. At the end of the evening the Envoy was flown back to Portsmouth, where it was landed again with the assistance only of its landing lights.

For the South Atlantic

A THIRD depôt ship has been ordered by D.L.H. for their South Atlantic service in order that the *Westfalen* and *Schwabenland* may be withdrawn at intervals for overhaul without interfering with the service. During the year, it will be remembered, the *Graf Zeppelin* carried the South Atlantic mails for a time while the two original depôt ships were being overhauled. It is possible, too, that the order for this third catapult ship, which is being built by the Howaldts works at Kiel, has been influenced by German North Atlantic aspirations.

Next week a second replacement Dornier Wal is being flown out to West Africa. The first was ferried out some time ago. These are not the new type with diesel engines.

Envoys for Africa

EARLY next year, as reported in *Flight* last week, the South African Government will take delivery of the first of a series of seven Airspeed Envoys, Series II, fitted with Armstrong Siddeley Cheetah IX engines. Four will be supplied for service on the South African Airways routes and three for military purposes.

Of the four S.A.A. machines, two will have accommodation for six passengers and two for five passengers. Both arrangements include, of course, a lavatory and space for luggage and freight. The military machines will carry a crew of three, with bomb racks, in addition to two machine guns, one firing forward through the nose of the fuselage, and under the control of the pilot, and the other fitted on a ring type mounting in the roof of the machine, giving an arc of fire throughout the whole of the upper hemisphere and downwards on either side.

All are designed for a top speed of 211 m.p.h., with a cruising speed of 189 m.p.h. at an altitude of 7,300 ft. The service ceiling is 24,000 ft. They are fitted with split trailing edge flaps.

A Year's Work by the Guild

AFTER reporting a year of progress at the annual meeting of the G.A.P.A.N., Capt. Guest outlined the attitude which this body had adopted to the requirements contained in *Notice to Airmen* No. 109, of 1934. While not wishing to lower the standard of the "B" licence, the Guild, remembering the financial aspect to pilots and the inadequacy of the time allowed, had set up a special sub-committee to deal with this question.

Acting on their recommendations, a deputation, as reported in *Flight* earlier in the year, conferred with the D.G.C.A. and his staff, and the following points were urged: The postponement of the enforcement of the notice (the date was subsequently extended for three months); the institution of a transport licence, for air line, taxi and charter work; and the institution of a limited "B" for internal use.

Another result of this *Notice to Airmen* was that the blind flying endorsement of the instructors' certificate was introduced, and the certificate was split into categories for land-plane, seaplane, and Autogiro pilots. This has since received the approval of the Air Ministry. Ninety-seven certificates, incidentally, have been issued and 142 renewed during the year.

The year saw the publication of the "Memoirs of Sir Sefton Brancker," who was the First Master of the Guild, and the proceeds of its sale will form the nucleus of a "Sefton Brancker Memorial Fund," to be used to assist necessitous members and associates and their dependents. Meanwhile steps are being taken to obtain other sources of income.

During the year the employment bureau has filled forty-eight vacancies at salaries ranging from £250 to £1,200 p.a. In recommending pilots for suitable vacancies the bureau has the assistance of a card index system which is being completed and contains the records and particulars of nearly every "B" licence pilot.

THE INDUSTRY

Instrumental Expansion

TWO spacious new bays have just been added to the Walthamstow (London, E.17) works of Short and Mason, Ltd., the well-known makers of aircraft and other instruments. The addition has been made, and the new machinery installed, with practically no interruption of normal production.

A Cellon Issue

CELLON, LTD., the well-known dope manufacturers, announce a share issue, for which the lists are open as from Wednesday, December 18. It will consist of 70,000 6 per cent. cumulative preference shares of £1 each at 21s. per share.

Capt. A. S. Keep

CAPT. A. S. KEEP, M.C., general manager of Westland Aircraft, Ltd., and a director of Petters' Ltd., is on his way back to his native Australia, after forty years. Seventeen years ago he joined Westland's as a test pilot, and warm tributes were paid to him by his colleagues recently, when they made him a presentation before his departure.

A Perth Appointment

MR. H. W. SIMS-WHITE, A.F.R.Ae.S., F.R.Met.S., has just been appointed chief ground instructor to the Air-work Reserve Training School at Perth. Mr. Sims, who is an expert on navigation and meteorology as well as on general aeronautical engineering, has been conducting a class for the Air Ministry's First-class Air Navigators' Licence at the L.C.C. School of Navigation.

Stalling of Tapered Wings

COMMENTING on the article by P. P. Nazir, on the stalling of tapered wings, published in *The Aircraft Engineer* (Monthly Technical Supplement to *Flight*) on November 28, 1935, Handley Page, Ltd., state that Mr. Nazir's experience tallies exactly with results which they themselves have obtained during experiments covering a period of eighteen months or so. It was found that the use of flaps made matters worse by aggravating the stalling of the tapered tips.

D.H. Figures

SOME interesting figures were quoted by the chairman, Mr. A. S. Butler, at the annual works dinner of the De Havilland Aircraft Co., Ltd., last Saturday. As a sign of the increase in business, Mr. Butler pointed out that the firm now employs more than 3,000 people. A letter from Jersey Airways stated that the D.H.86 had proved very popular with passengers, 44,000 of whom had been carried without injury. Altogether seventy-six operators were using the 86, Mr. Butler said, and their machines had covered a total of ten million miles. Although only one D.H.90 had been built so far, they had orders to last four to five months. In the engine works the output had increased from 64,000 h.p. to 119,000 h.p., a sign of the growing popularity of the Gipsy.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

RIBBESFORD COMPANY LTD. Private company, registered November 14. Capital, £2,500 in £1 shares (2,300 7½ per cent. cumulative preference and 200 ordinary). Objects: to acquire from J. H. Onions the rights to manufacture, sell, etc., oleopneumatic shock-absorber struts for aircraft landing gear. The first directors are: Sydney Hill (director of Beech Hill and Co., Ltd.); Sydney D. Walker, director of John Perks and Sons, Ltd.; John H. Onions; Eric Gledhill, electrical manager; Peter W. Thornhill. Registered office: 54, Bilston Road, Wolverhampton.

WALTER POTTER LTD. Private company, registered November 28. Capital, £300 in £1 shares. Objects: to carry on business as manufacturers of sheet metal products for motor, aircraft and allied trades. The first directors are not named. Solicitors: Reynolds and Co., 26, Budge Row, London, E.C.

BOURNEMOUTH FLYING CLUB, LTD. Private company, registered December 10. Capital, £100 in 1s. shares. Objects: To establish and conduct a club, to promote and encourage aerial navigation and knowledge, etc. Directors: Francis C. Fisher, John V. C. Pearson. Registered office: Salisbury House, Richmond Hill Bournemouth.

MANCHESTER AERONAUTICAL SOCIETY, LTD. Private company, registered December 7. Capital, £100 in 1s. shares. Objects: To acquire the assets, books, apparatus, gliders and the like, the property of the members of the Manchester Branch of the Royal Aeronautical Society and to administer these for the benefit of the said members, and to acquire and deal in gliders, etc. Directors: Basil A. G. Meads, Roy Chadwick, Roy H. Dobson. Registered office: Camphill, Great Hucklow, Derby.

AIRCRAFT CONSTRUCTIONS, LTD. Private company, registered December 6. Capital, £2,000 in 1,000 preferred ordinary shares of £1 each and 2,000 deferred shares of 1s. each. Objects: To carry on the business of manufacturers and repairers of and dealers in aeroplanes, etc. Subscribers: Doris I. M. Robins, Robert G. Doig. First directors not named. Registered office: 61, Sidcup Hill, Sidcup, Kent.

BRITISH PRESSED PANELS, LTD. Registered as a "private" company on December 10 with a capital of £80,000 in £1 shares. Objects are to carry on the business of sheet metal and tinplate makers and workers, iron, steel and brass-founders, etc., and motor and general engineers. First directors to be appointed by the subscribers. Solicitor: B. S. Gorton, Coventry.

RILEY AIRCRAFT, LTD. Registered as a private company on December 10 with a nominal capital of £100 in £1 shares. Objects: To carry on the business of designers, builders, and repairers of and dealers in aeroplanes, etc. First directors to be appointed by the subscribers. Solicitor: B. S. Gorton, Coventry.

PORTSMOUTH AERO CLUB, LTD. Private company, registered December 10. Capital, £1,250 in 100 ordinary shares of £10 each and 50 founders' shares of £5 each. Objects: To promote and encourage aerial navigation, and to establish and maintain a club, etc. Permanent directors: Owen R. Guard, Sir Chas. Henry Ross, Bt. Registered office: The City Airport, Portsmouth.

INCREASE OF CAPITAL

VICKERS (AVIATION), LTD., Byfleet Road, Weybridge, Surrey.—The nominal capital has been increased by the addition of £650,000 in £1 ordinary shares beyond the registered capital of £250,000. This increase is for the purpose of acquiring the whole of the issued capitals of Airship Guarantee Co., Ltd., the Broadway Finance and Investment Co., Ltd., and the Manufacturers' Estates and Assets Co., Ltd. The directors are Sir Robert McLean and Comdr. James Bird, chairman and director respectively of the Supermarine Aviation Works (Vickers), Ltd.

AERONAUTICAL PATENT SPECIFICATIONS

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.).

Published December 5, 1935.

- 3539. SIEMENS-APPARATE UND MASCHINEN-GEZ.: Apparatus for automatically regulating the course or speed of an aircraft (438,020).
- 3540. SIEMENS-APPARATE UND MASCHINEN-GEZ.: Apparatus for automatically regulating the attitude, course or speed of an aircraft (438,021).
- 6605. TENNANT, W. J. (Tatra Works, Ltd., Motor Car and Railway and Wagon Builders): Streamline formation of bodies for land vehicles and aircraft (437,885).
- 14007. FEDERATED ENGINEERS, LTD., and BRACKENBURY, E. W.: Propulsion of aircraft (438,037).
- 27630. BRISTOL AEROPLANE CO., LTD., FEDDEN, A. H. R., and BUTLER, L. F. G.: Adjustable-pitch airscrews (437,993).
- 28069. OERMICHEN, E. E.: Aircraft (437,910).
- 3306. SPERRY GYROSCOPE CO., INC.: Caging-devices for gyro-verticals (437,861).
- 7825. MERZ, P.: Propeller drive for wingless aircraft (437,787).
- 10021. SPERRY GYROSCOPE CO., INC.: Gyroscopic indicators (437,791).
- 12581. HART, E. P.: Wind-direction indicator for aerodromes and analogous situations (437,794).

(Published December 12, 1935.)

- 7746. ASBOTH, O.: Rotary wings for aircraft (438,111).
- 14424. BENDIX AVIATION CORPORATION: Indicating-instruments such as sensitive altimeters (438,137).
- 19550. HORSBRUGH, A. M.: Emergency fittings for aircraft (438,384).
- 35231. DOWTY, G. H.: Retractable aircraft undercarriages (438,296).
- 35951. FAIREY AVIATION CO., LTD., and EBBUTT, C. G. W.: Bomb-aimer's wind-screen (438,300).
- 36068. ELEKTRONMETALL GEZ.: Shock-absorbing means for the undercarriages of aircraft (438,165).
- 12477. FAIREY AVIATION CO., LTD., and PEARCE, H. L.: Method of covering aircraft components (438,327).
- 13776. HOUSTON, R. G.: Aircraft (438,332).
- 35082. JACKSON, L. MELLERSH (Comunidad Propulsor Chili): Cylindrical propellers (438,295).
- 8238. CREED, F. G.: Floating stations (438,353).

Publishers' Announcement

CHRISTMAS HOLIDAY

Miscellaneous Advertisements intended for the issue of December 26 must be in our hands by first post on Friday, December 20.

This issue will be on sale two days earlier than usual, i.e. on Tuesday, December 24.

FLIGHT PUBLISHING CO., LTD.